US006367653B1

(12) **United States Patent**
Ruskin et al.

(10) **Patent No.: US 6,367,653 B1**
(45) **Date of Patent: Apr. 9, 2002**

(54) **CENTRALIZED MACHINE VENDING METHOD**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/666,038**

(22) Filed: **Sep. 20, 2000**

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/414,910, filed on Oct. 8, 1999, which is a continuation-in-part of application No. PCT/US98/08064, filed on Apr. 15, 1998, which is a continuation-in-part of application No. 08/844,767, filed on Apr. 22, 1997, now abandoned.

(60) Provisional application No. 60/104,006, filed on Oct. 13, 1998.

(51) **Int. Cl.**[7] **B65G 59/00**

(52) **U.S. Cl.** **221/1**; 221/197

(58) **Field of Search** 221/1, 6, 7, 9, 221/11, 17, 154, 197, 75, 232, 287

(56) **References Cited**

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6,050,448 A	*	4/2000	Willis	221/197

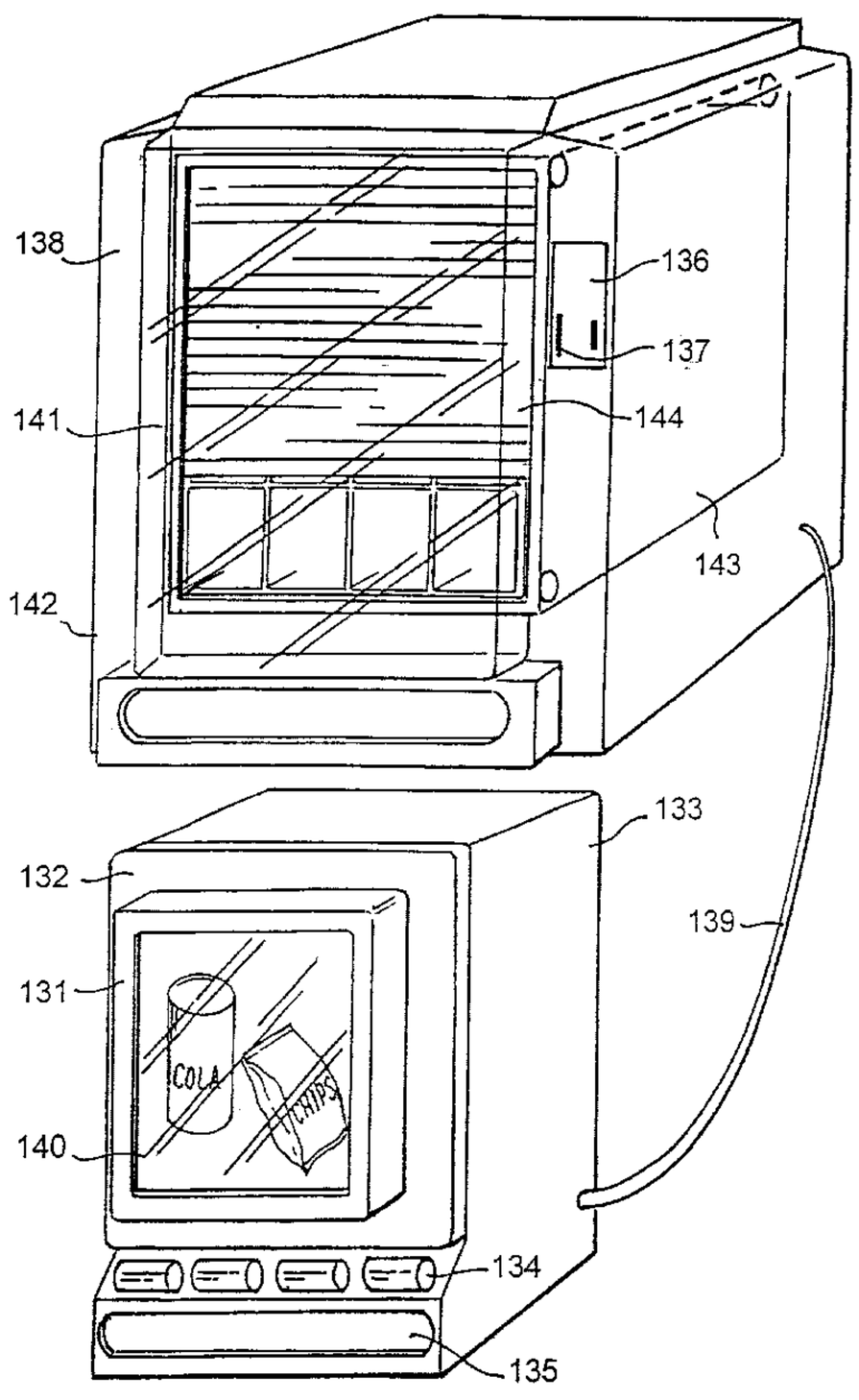
* cited by examiner

Primary Examiner—Kenneth W. Noland
(74) *Attorney, Agent, or Firm*—Henri J. A. Charmasson; John D. Buchaca

(57) **ABSTRACT**

A centralized method for selling items through a plurality of vending machines installed at various companies' sites comprises using vending machines having a substitutable goods-holding magazines from which goods can be extracted only when fully installed inside a vending machine and only by use of a special key when the magazines are outside their machines. The magazines are filled at the supply center and distributed along pre-established delivery routes. The servicing of each machine consists essentially of opening the machine, removing the previously installed magazine, substituting a new full magazine and securely locking the machine without any accounting of goods or currency or any other maintenance work.

11 Claims, 21 Drawing Sheets



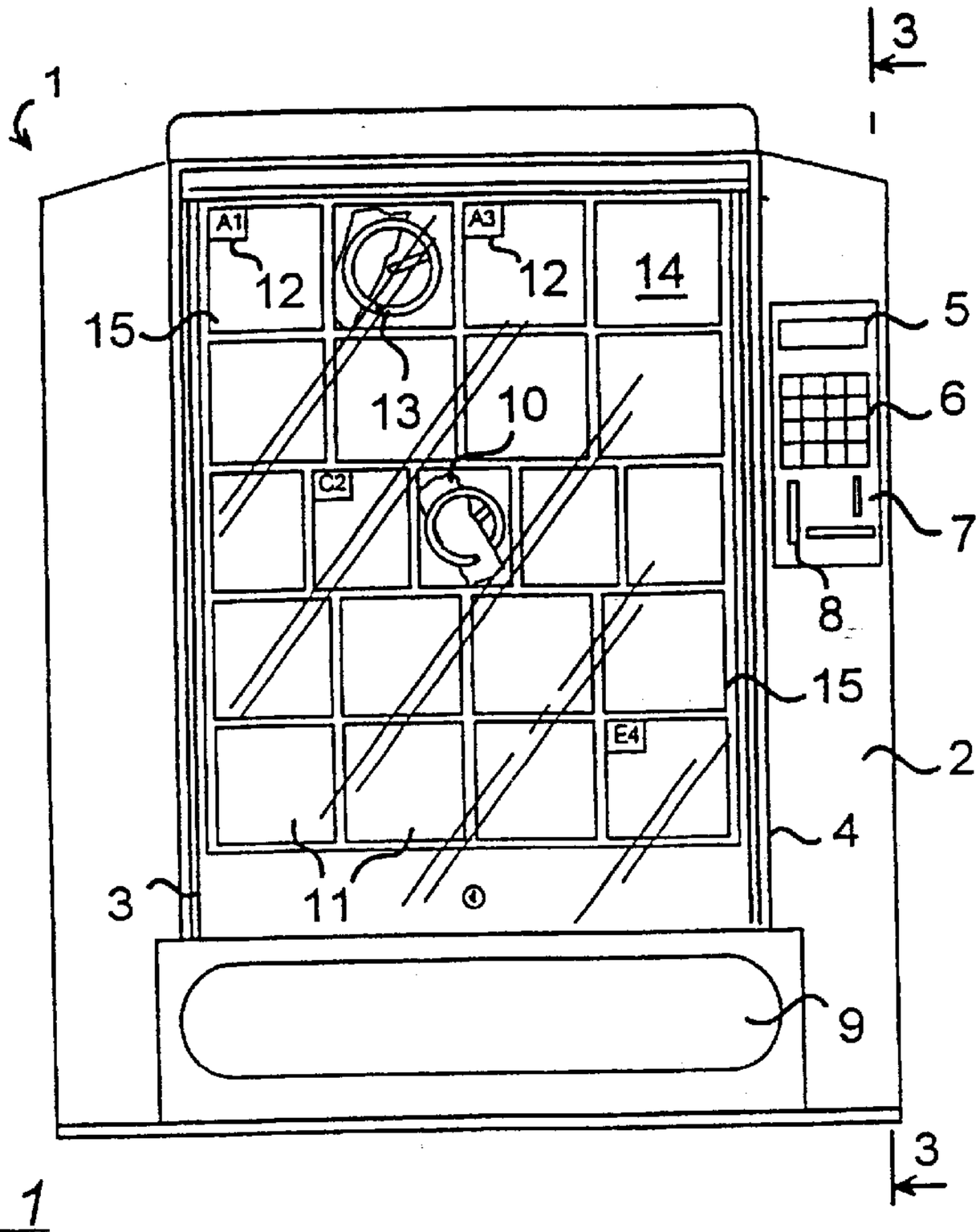

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FIG. 1

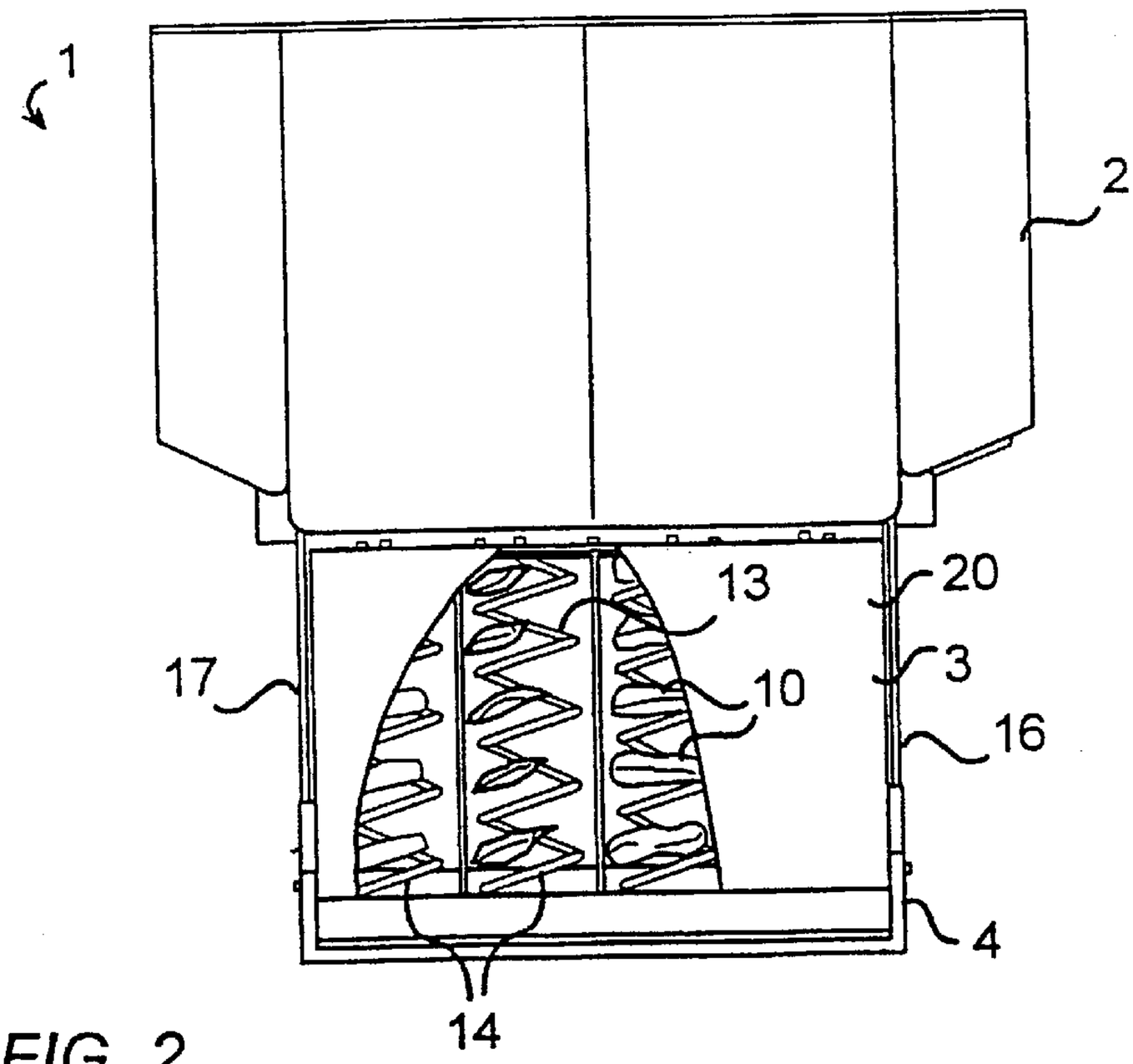
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FIG. 2

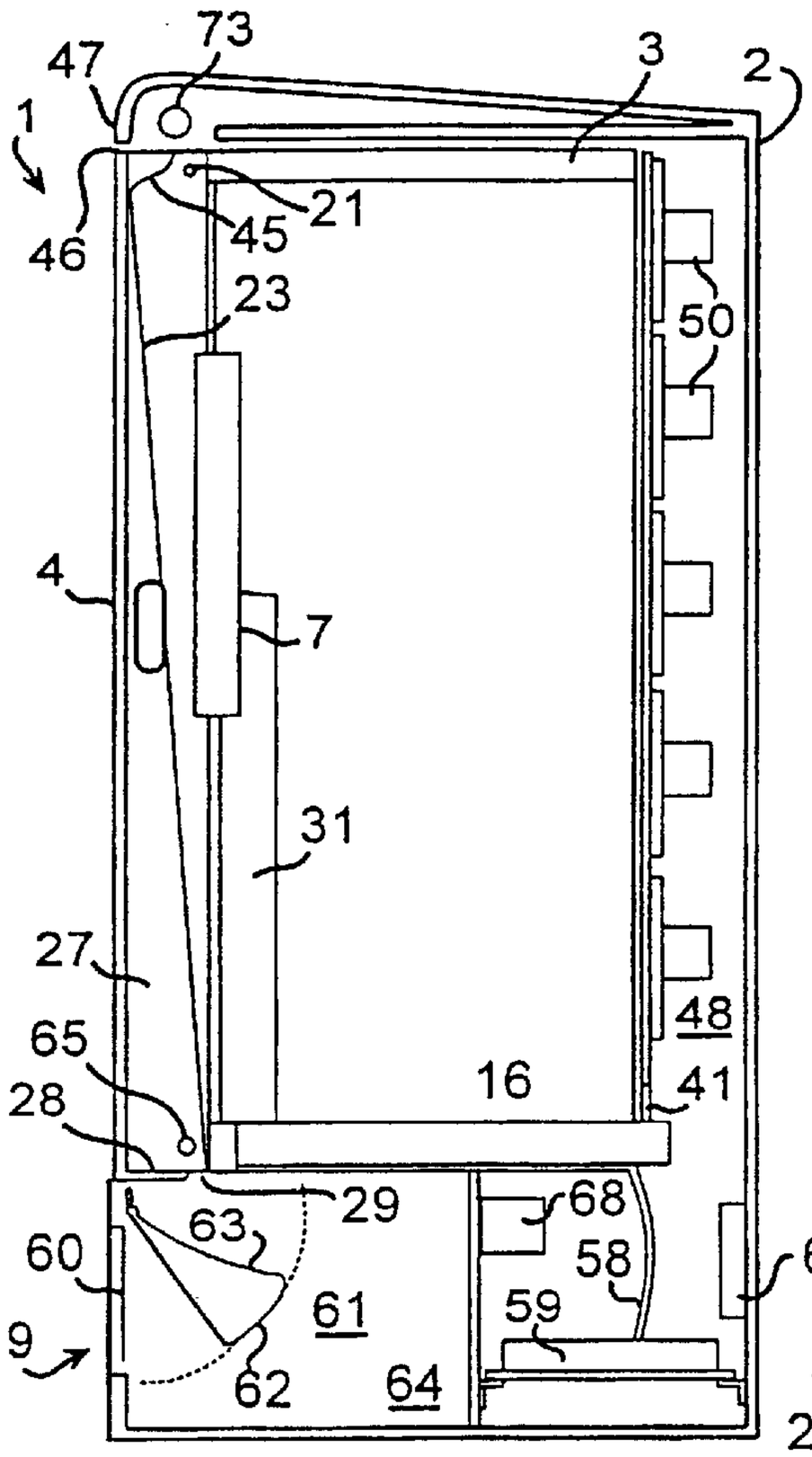


FIG 3

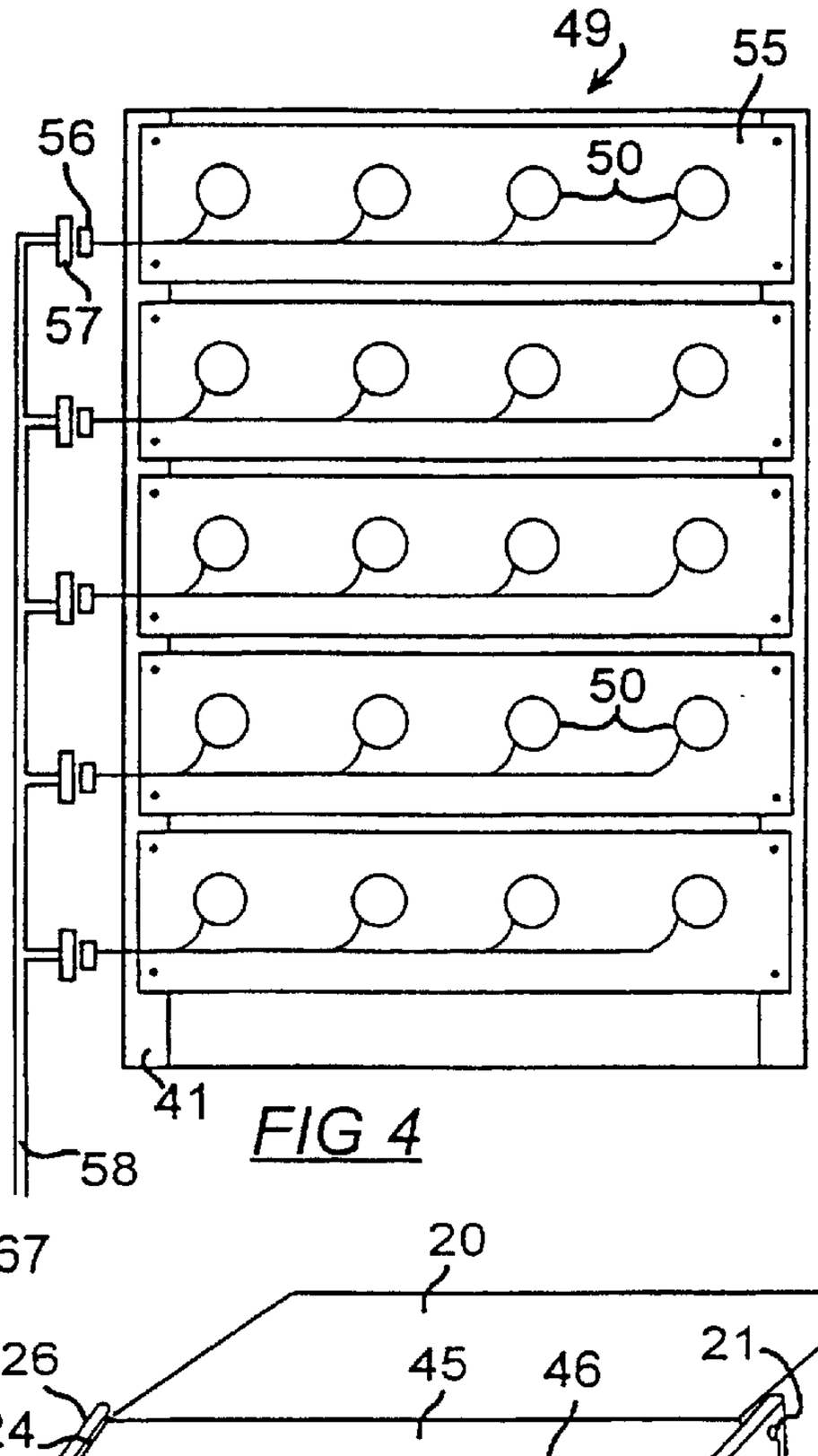


FIG 4

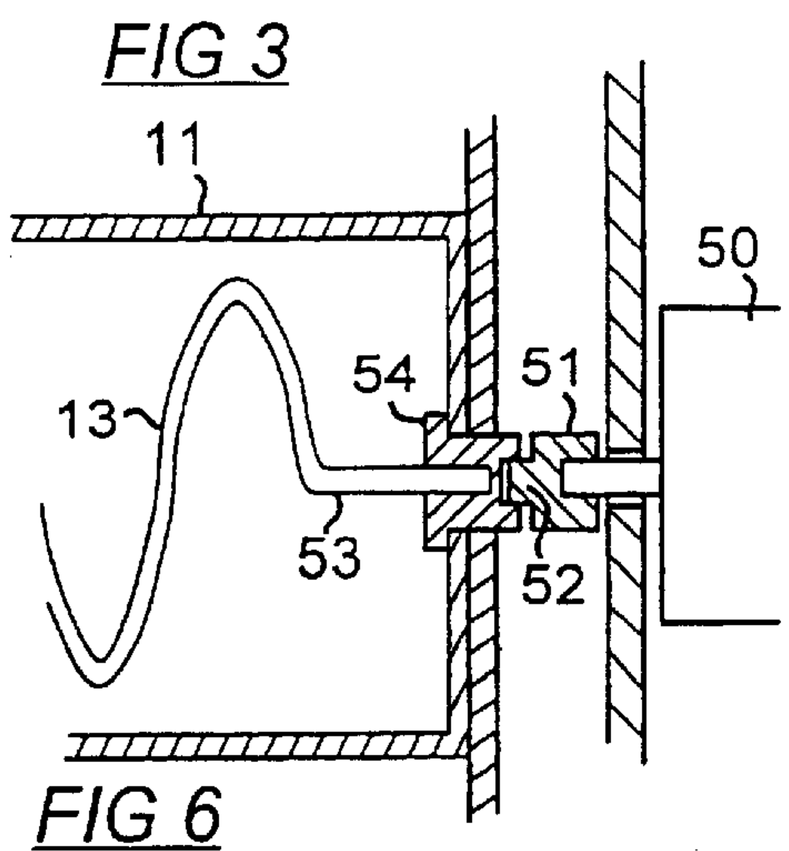
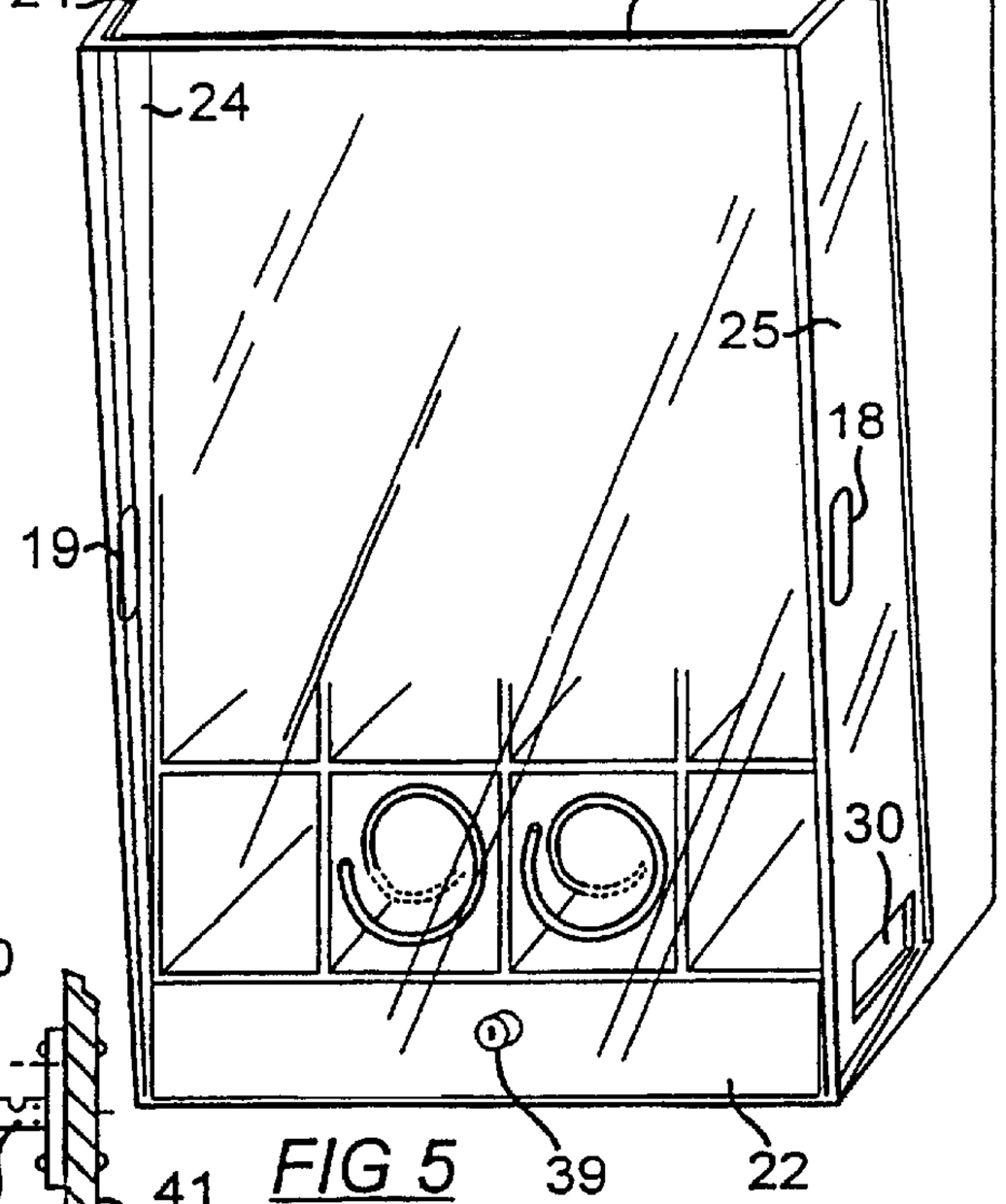


FIG 6



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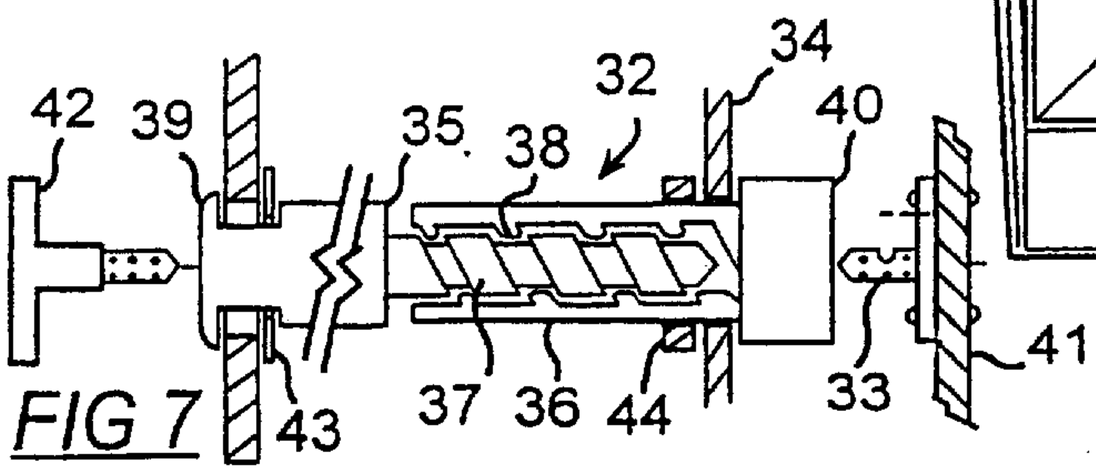

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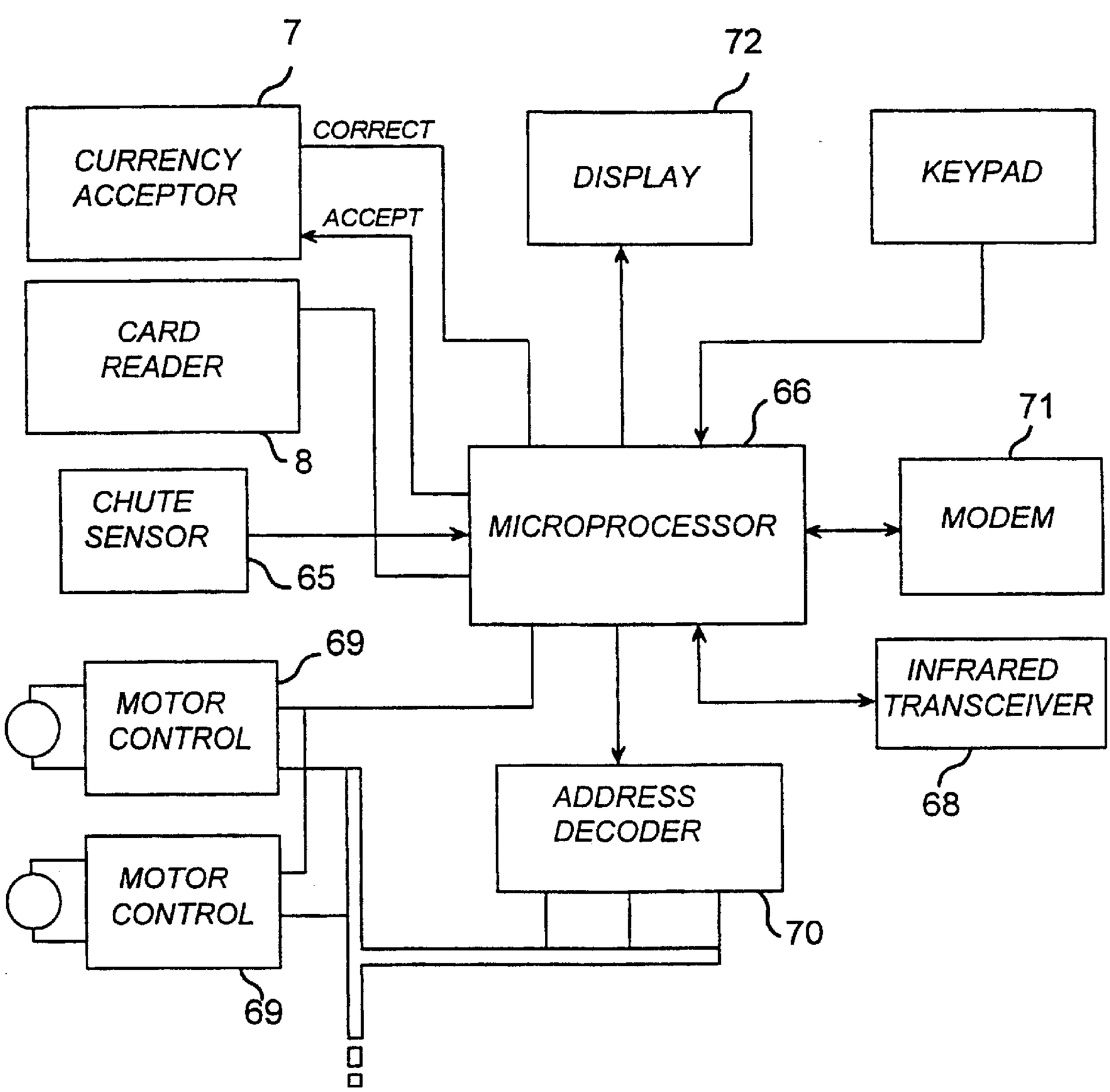
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72
CURRENCY ACCEPTOR
CORRECT
ACCEPT
DISPLAY
KEYPAD
CARD READER
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CHUTE SENSOR
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MICROPROCESSOR
MODEM
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MOTOR CONTROL
INFRARED TRANSCEIVER
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ADDRESS DECODER
MOTOR CONTROL
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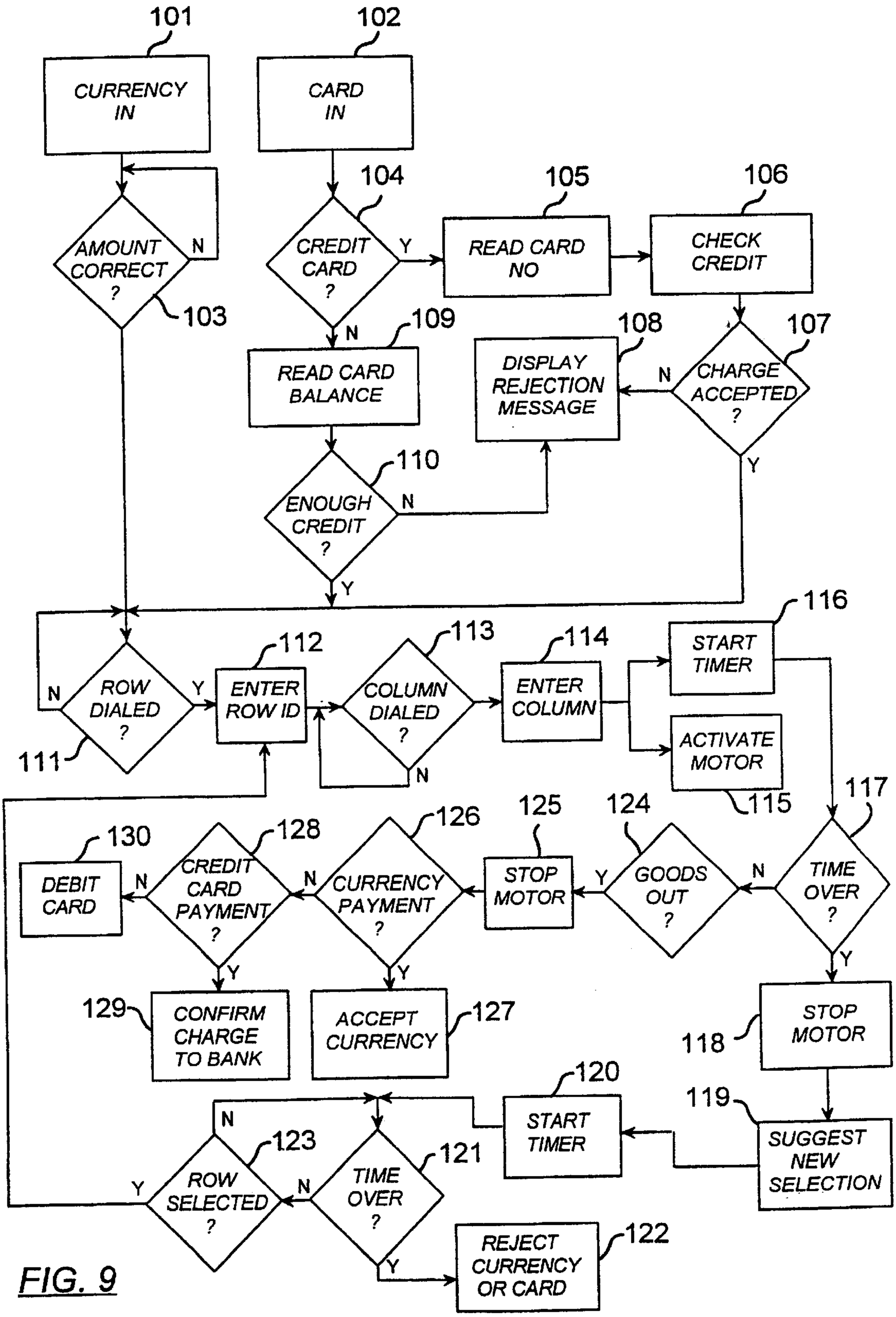
FIG. 8


101
CURRENCY IN
102
CARD IN
104
CREDIT CARD ?
Y
N
105
READ CARD NO
106
CHECK CREDIT
AMOUNT CORRECT ?
N
103
109
READ CARD BALANCE
108
DISPLAY REJECTION MESSAGE
107
CHARGE ACCEPTED ?
N
Y
110
ENOUGH CREDIT ?
N
Y
116
ROW DIALED ?
N
Y
111
112
ENTER ROW ID
113
COLUMN DIALED ?
N
114
ENTER COLUMN
START TIMER
ACTIVATE MOTOR
115
117
TIME OVER ?
N
Y
124
GOODS OUT ?
Y
125
STOP MOTOR
126
CURRENCY PAYMENT ?
N
Y
128
CREDIT CARD PAYMENT ?
N
Y
130
DEBIT CARD
129
CONFIRM CHARGE TO BANK
127
ACCEPT CURRENCY
118
STOP MOTOR
120
START TIMER
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SUGGEST NEW SELECTION
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ROW SELECTED ?
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TIME OVER ?
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122
REJECT CURRENCY OR CARD

FIG. 9

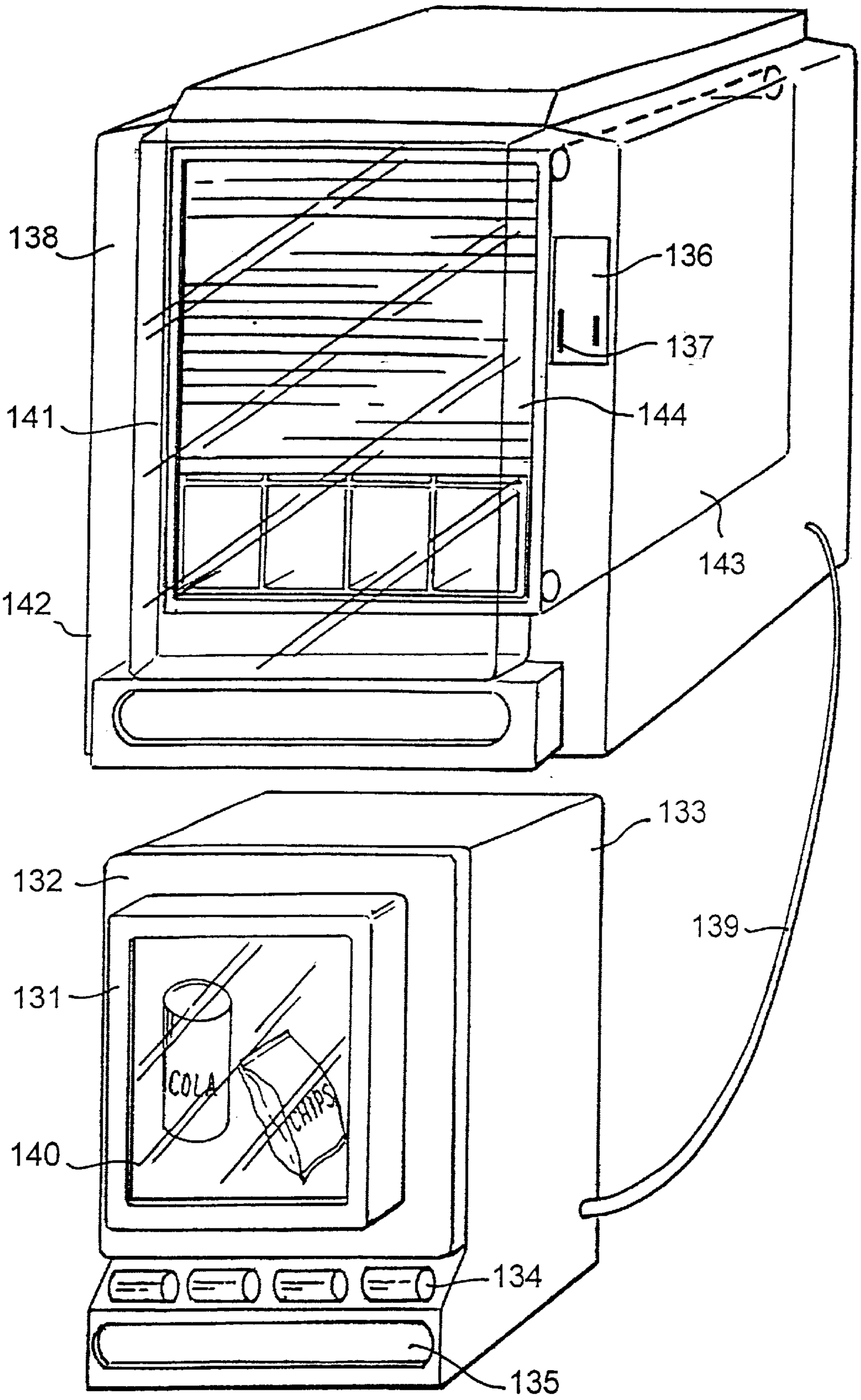
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FIG. 10

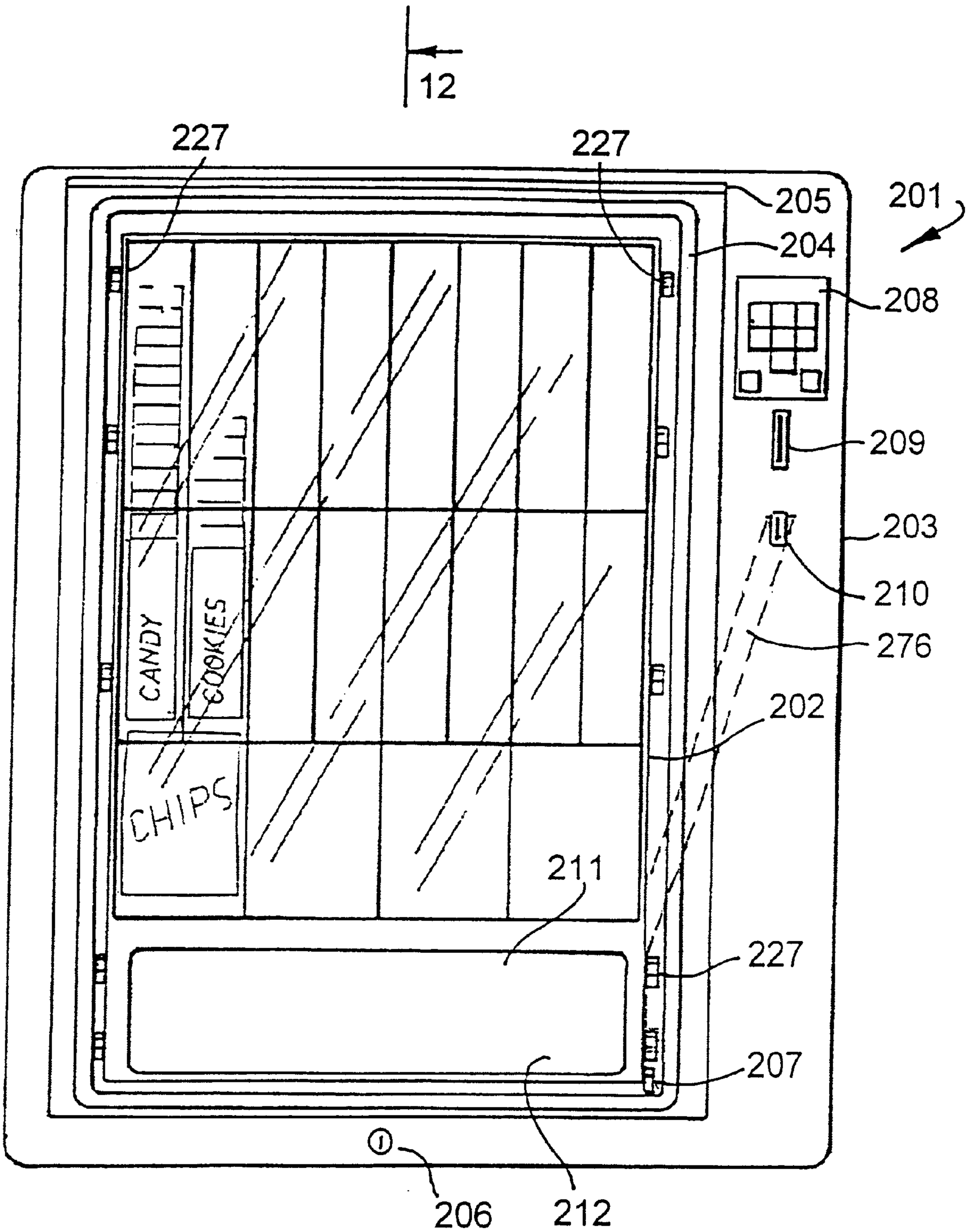
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FIG. 11

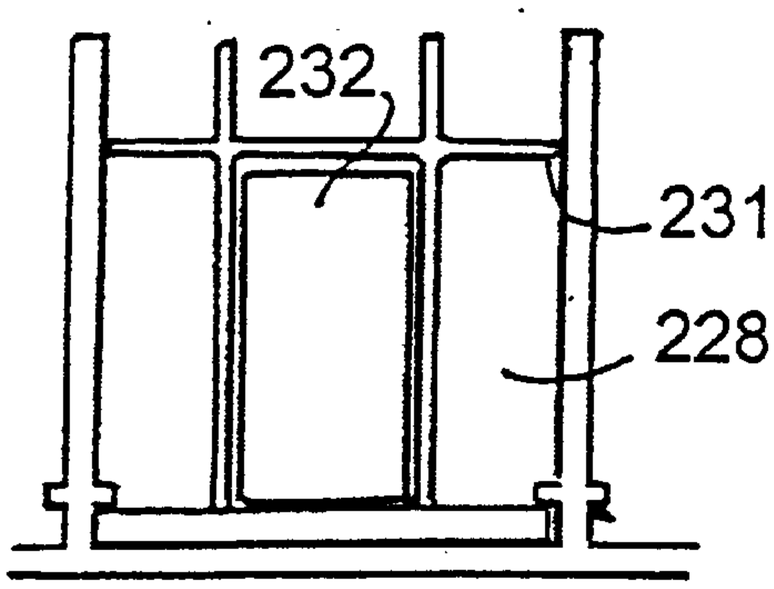
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FIG. 13

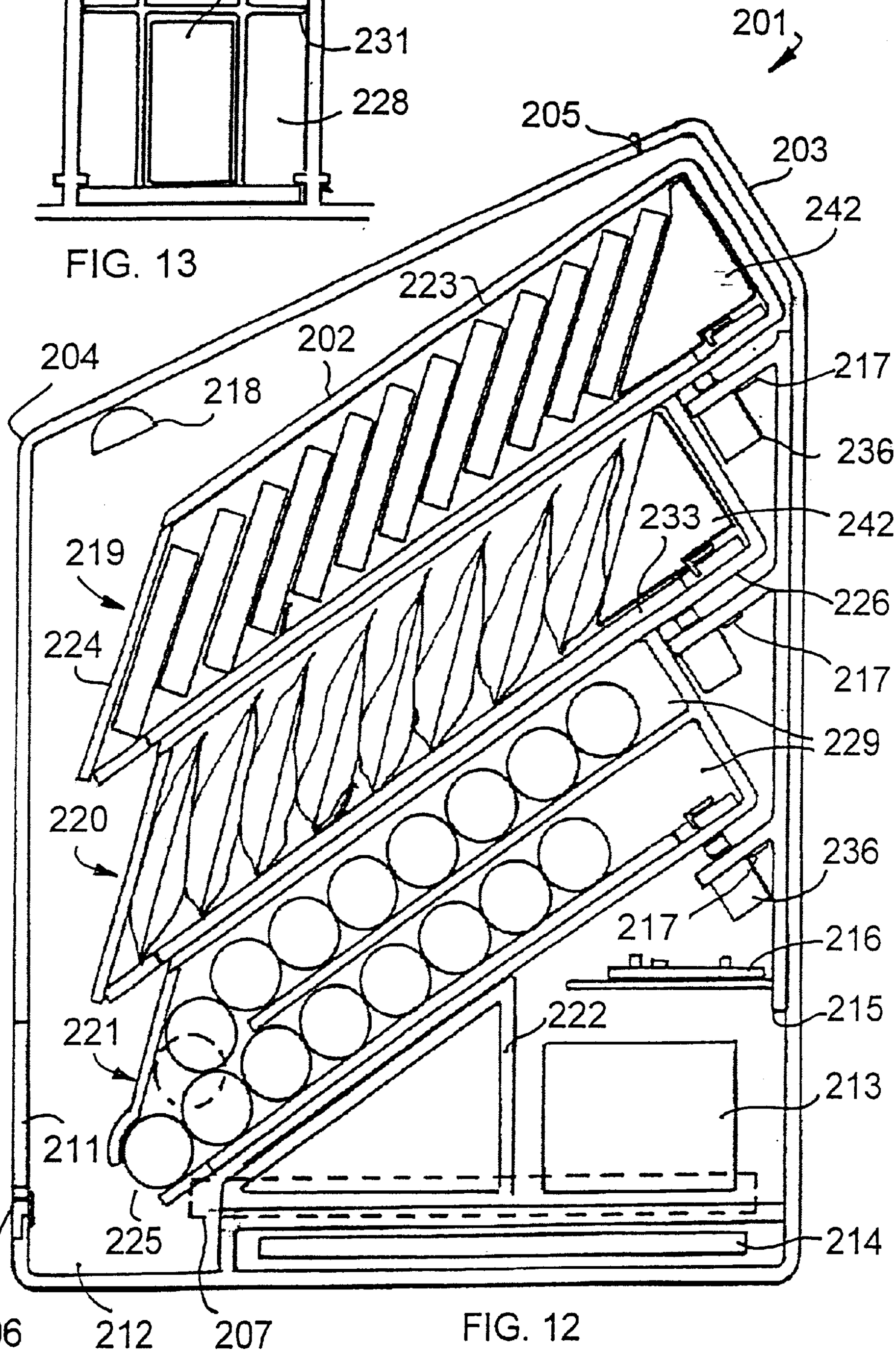
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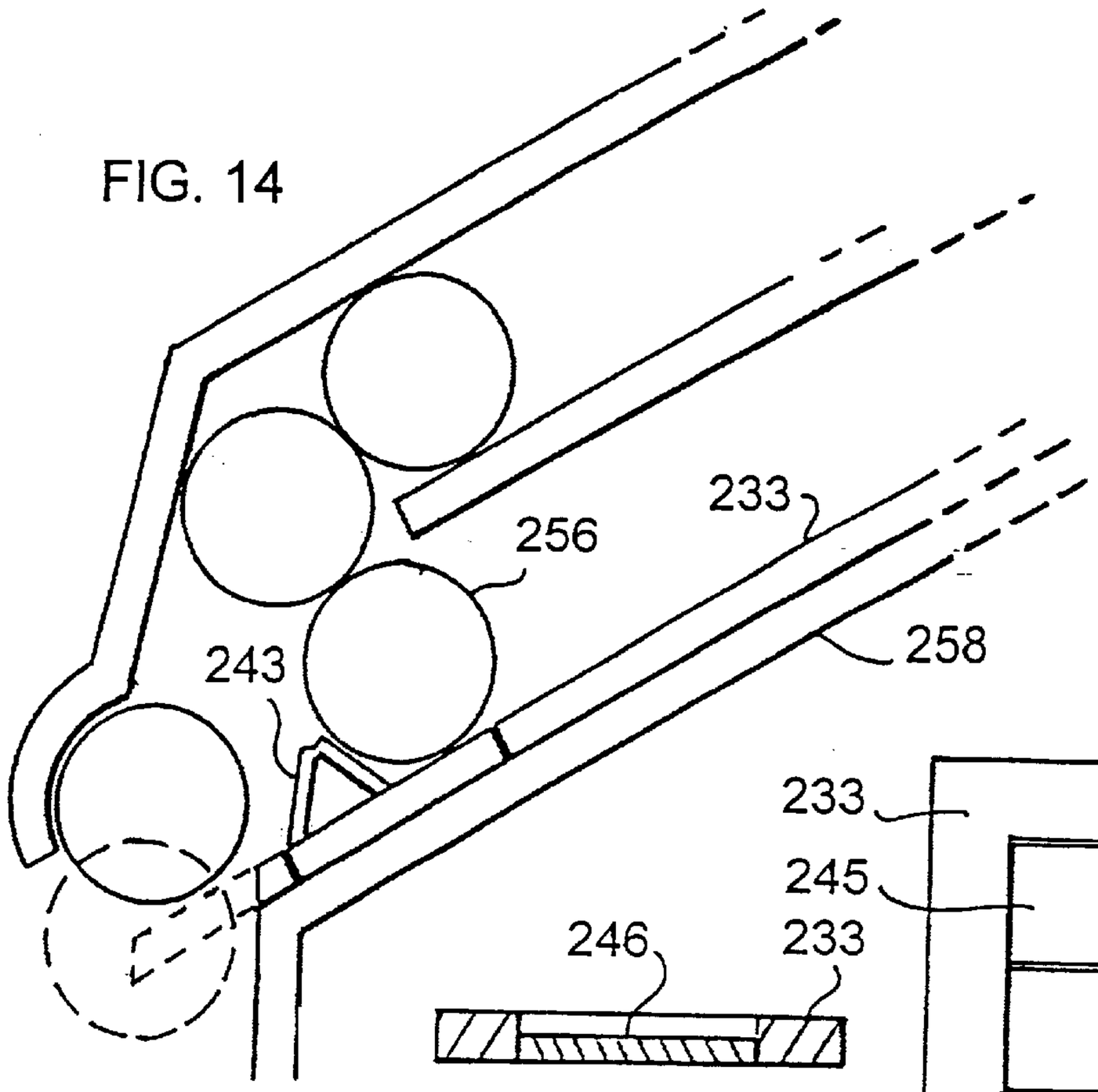
FIG. 12

FIG. 14



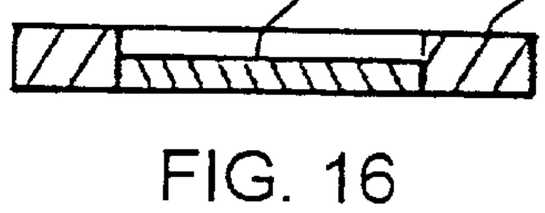
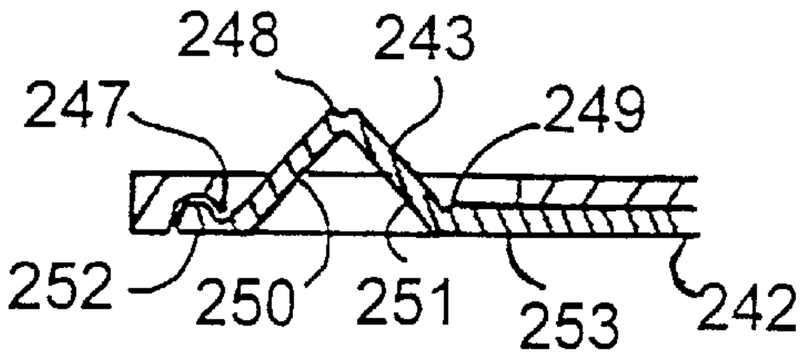


FIG. 16



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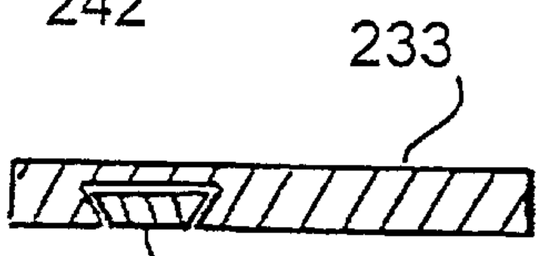

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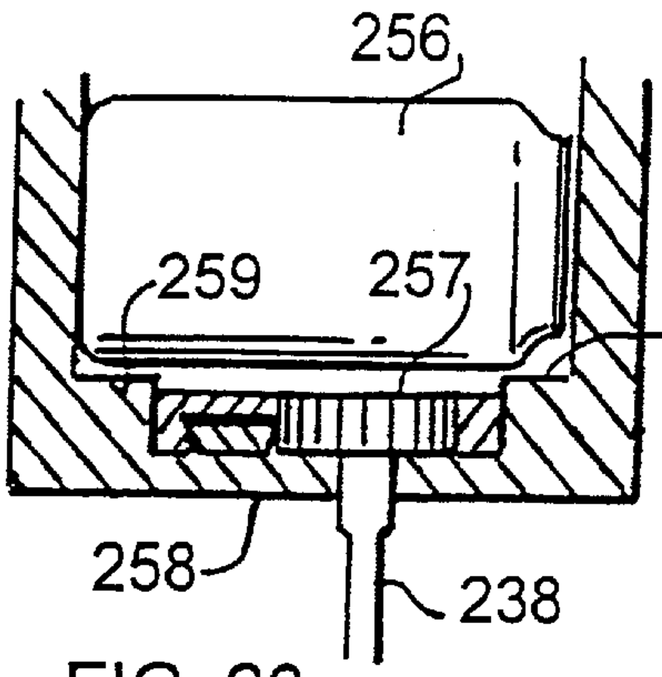

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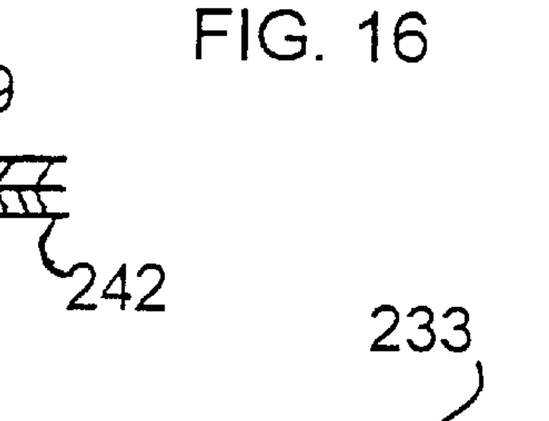
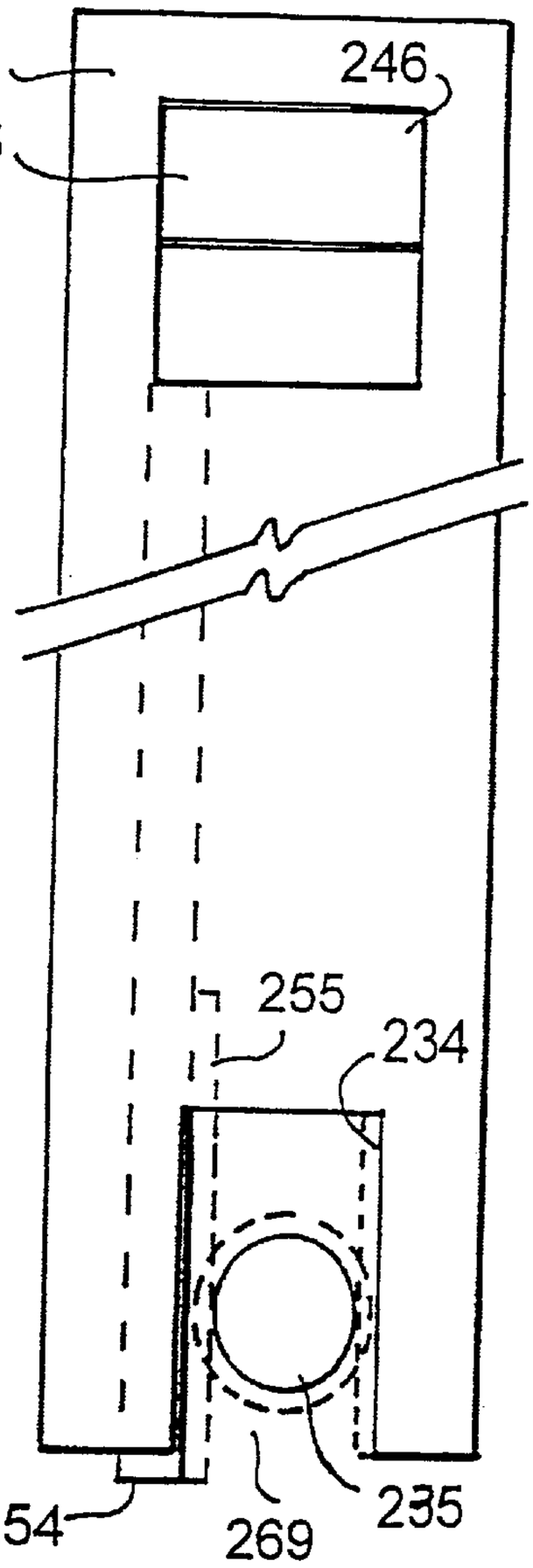


FIG. 18

FIG. 15



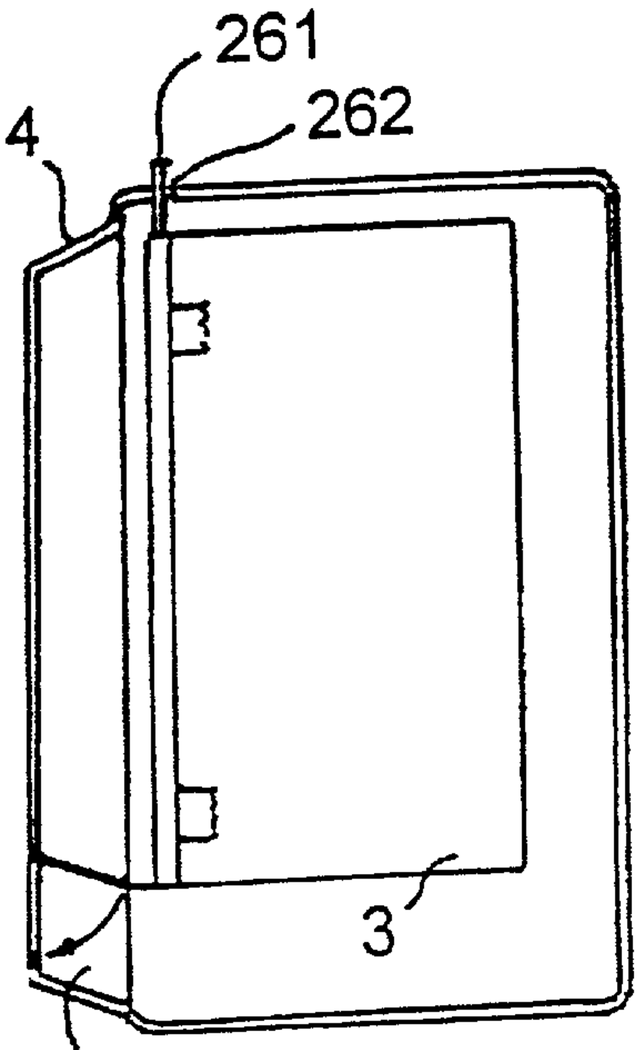


FIG. 22

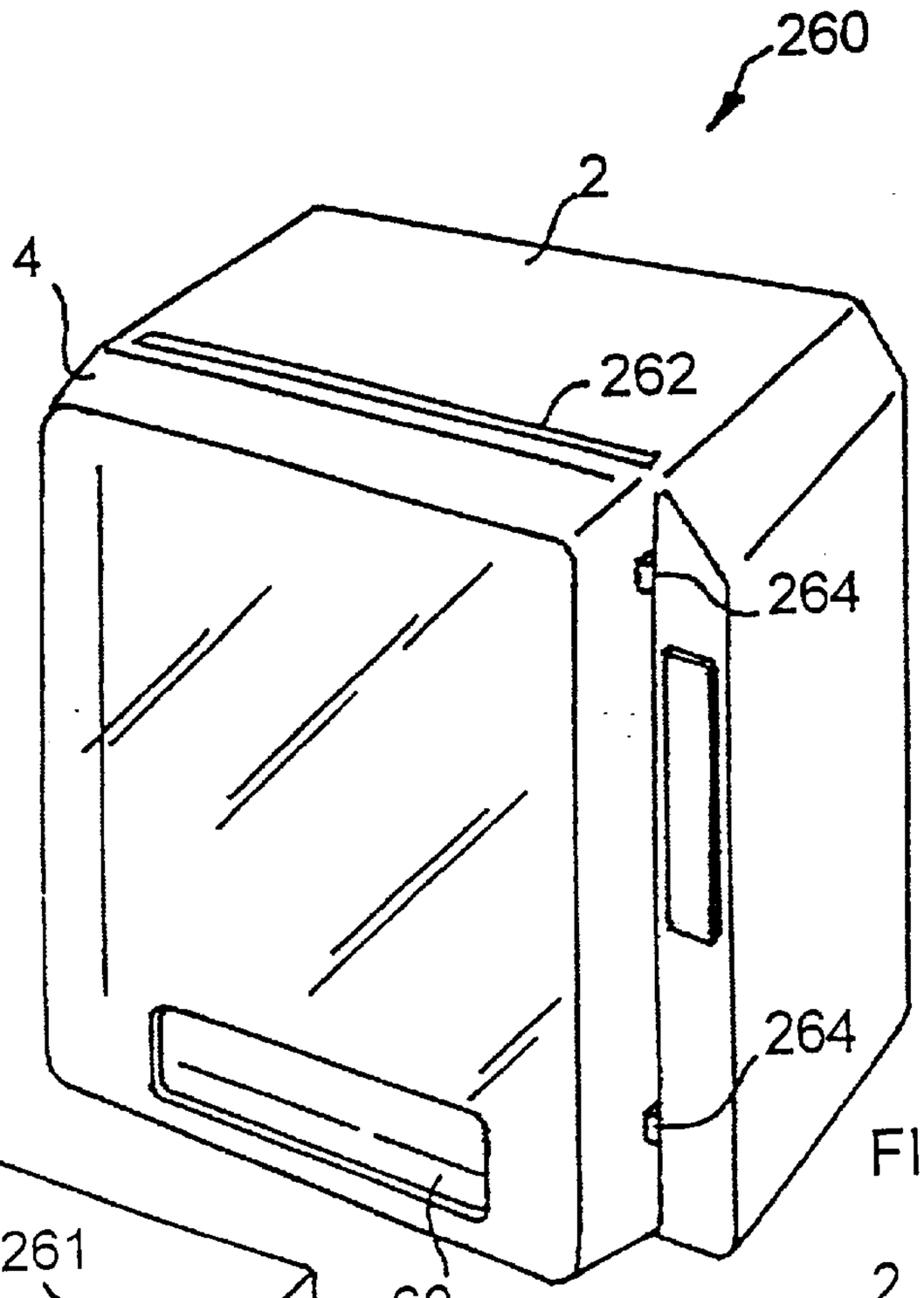


FIG. 21

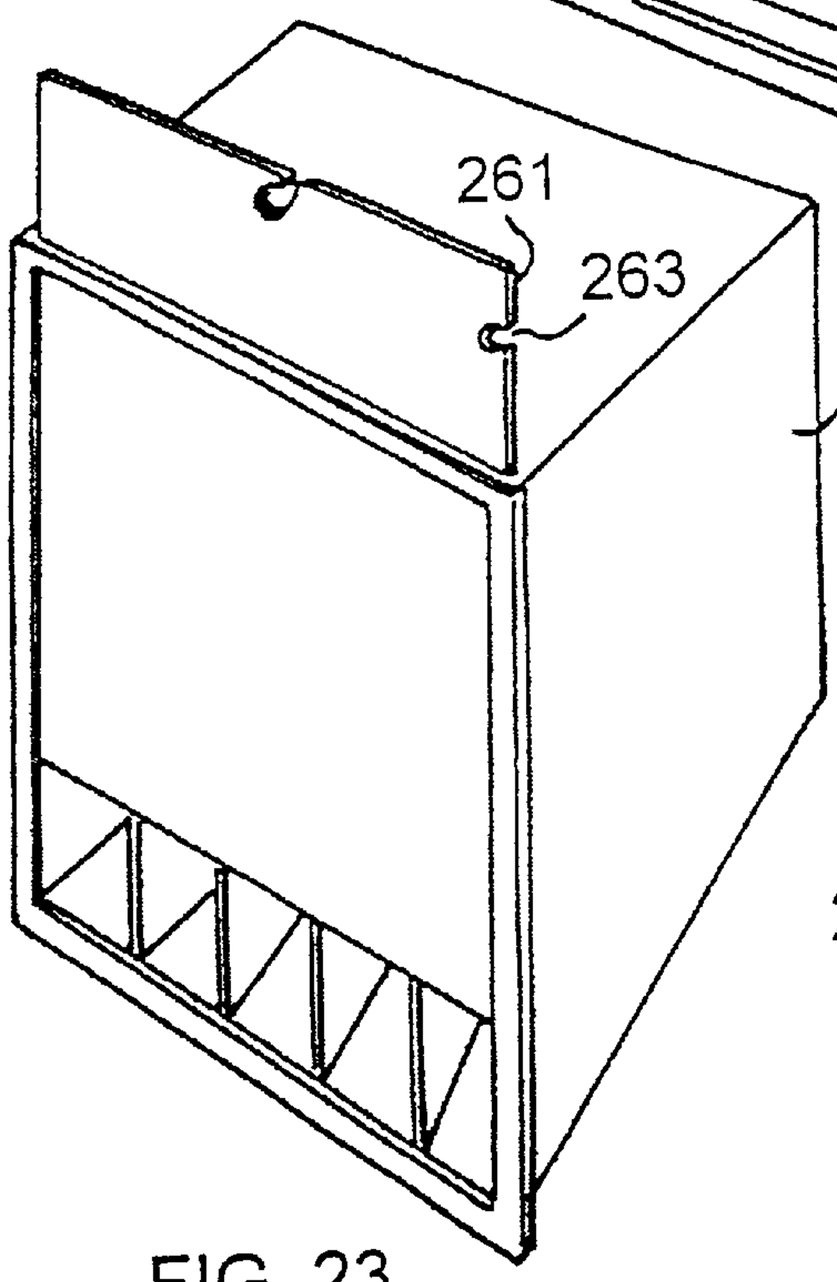


FIG. 23

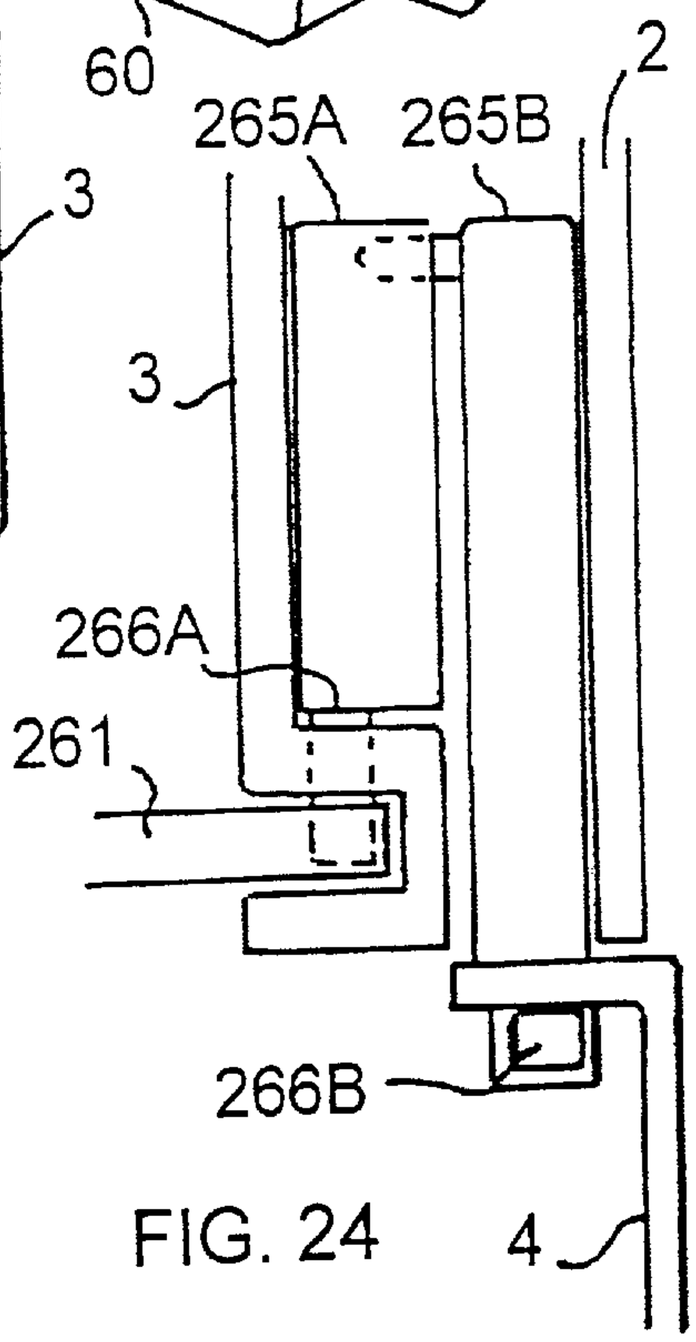


FIG. 24

FIG. 27

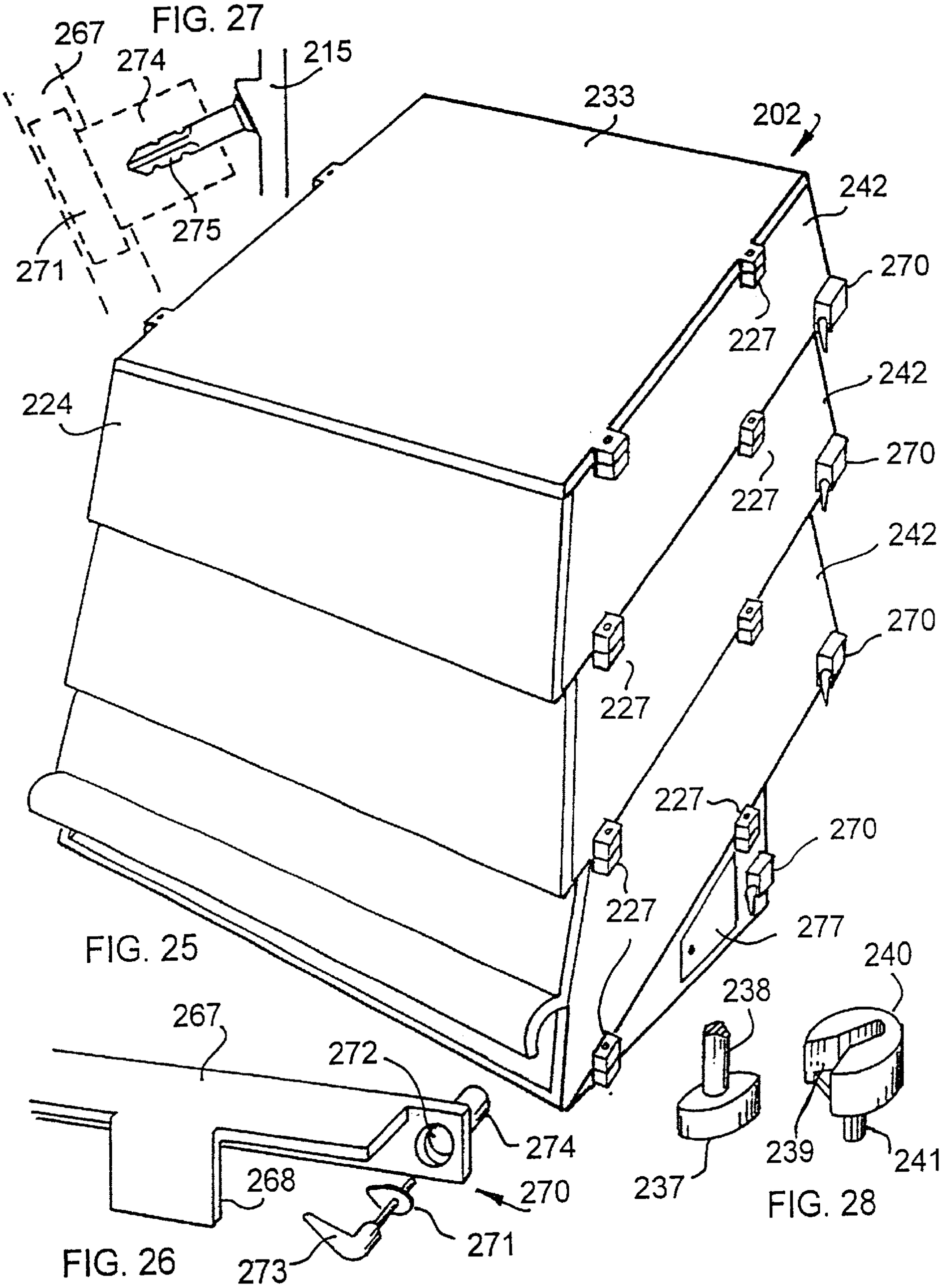

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FIG. 28
FIG. 25
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FIG. 26

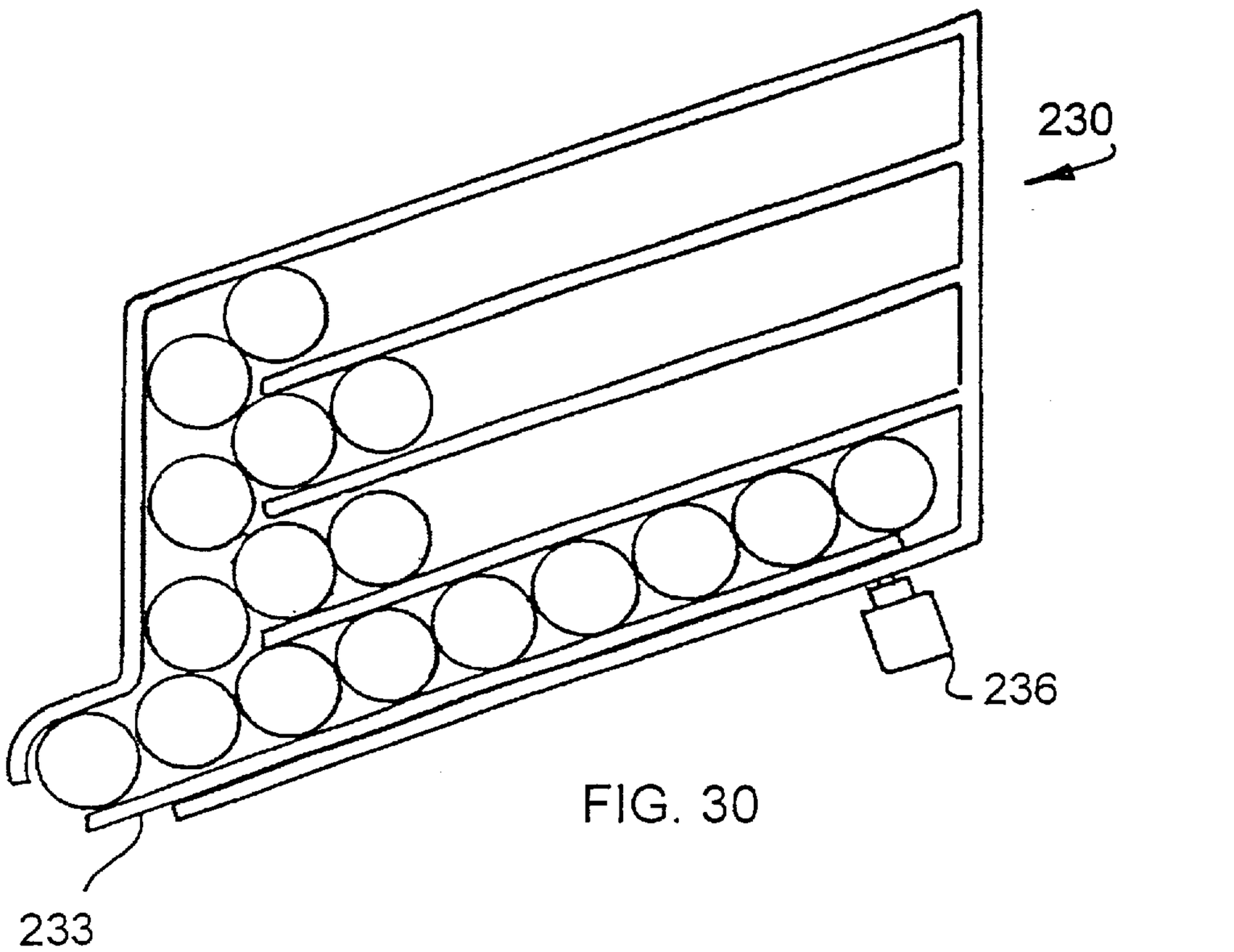


FIG. 30

FIG. 29

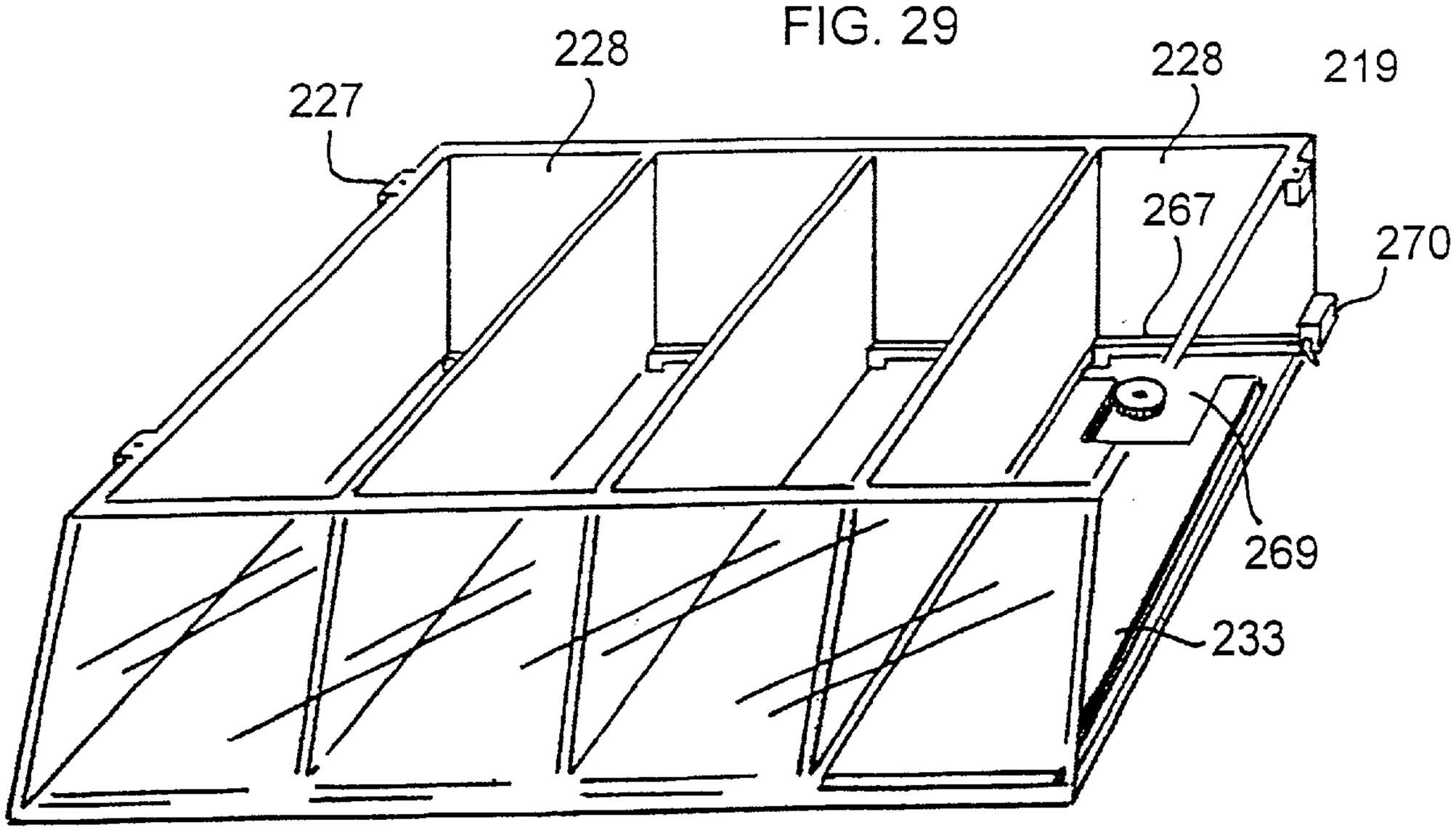


FIG. 31

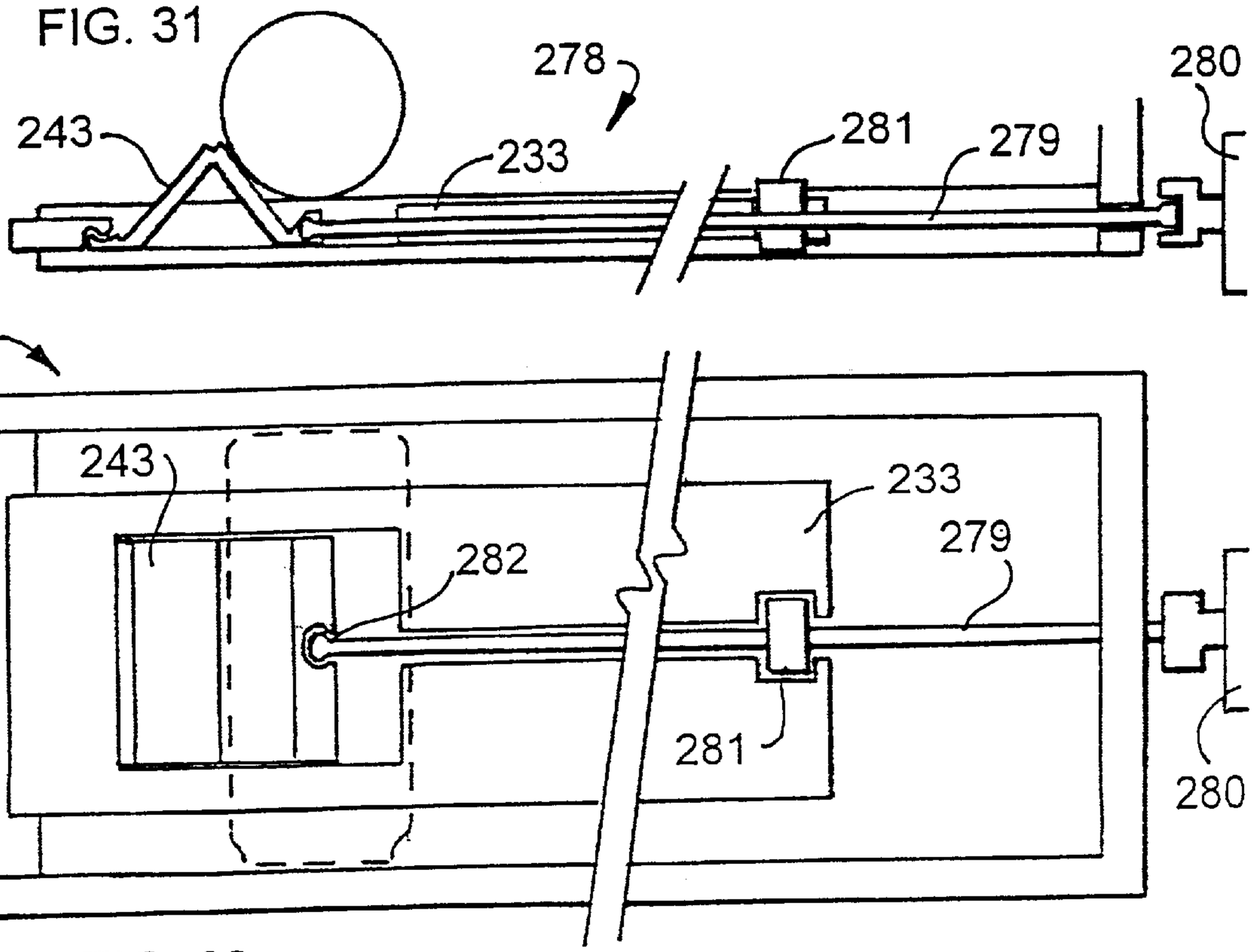


FIG. 32

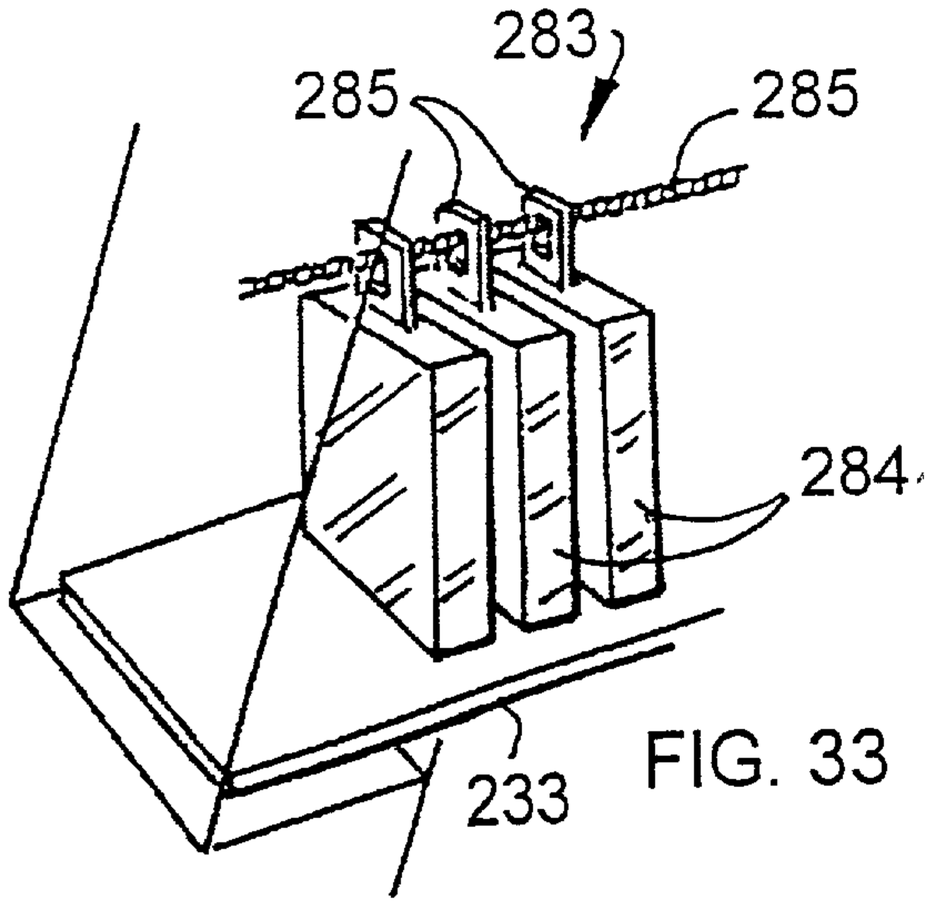


FIG. 33

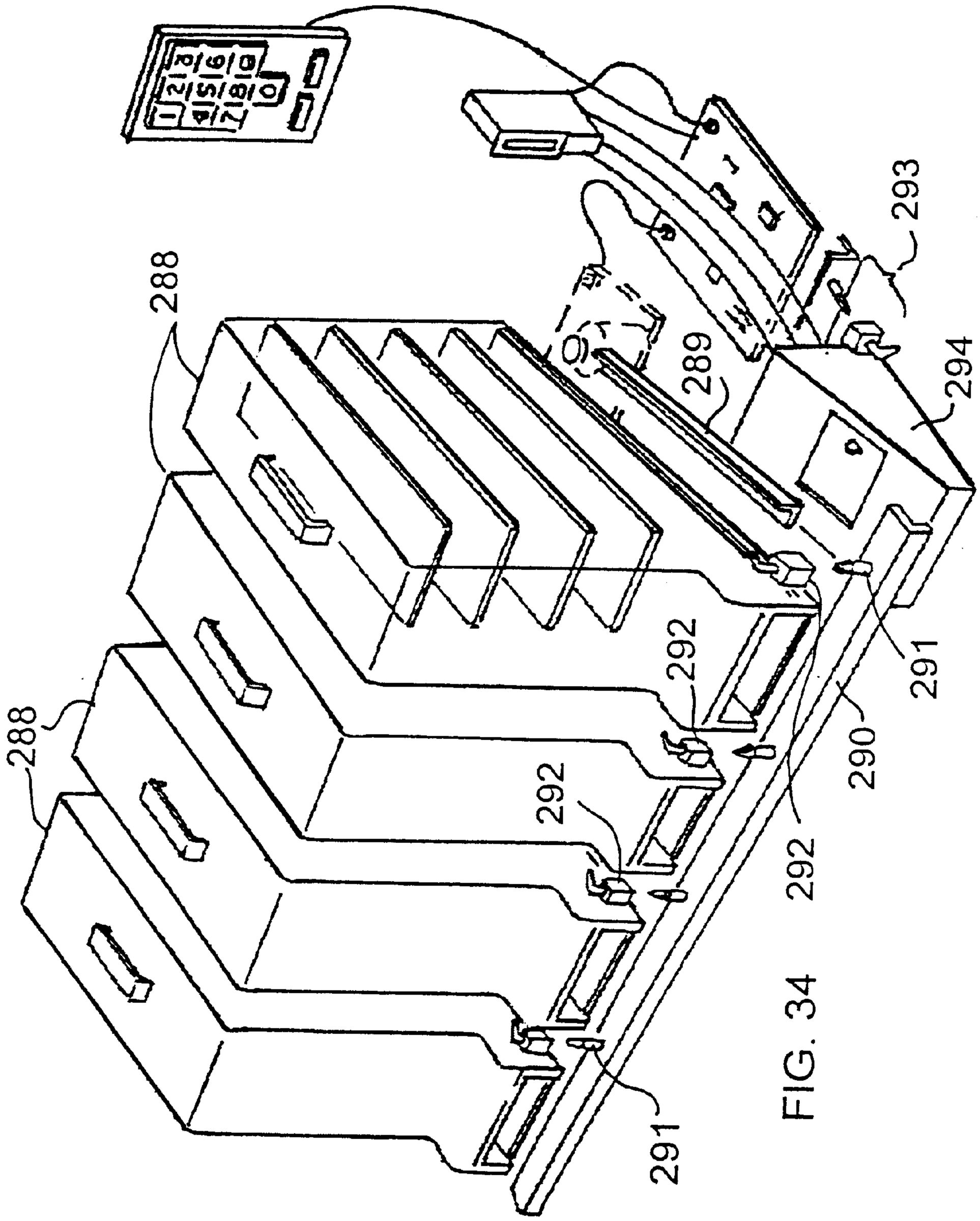


FIG. 34

FIG. 35

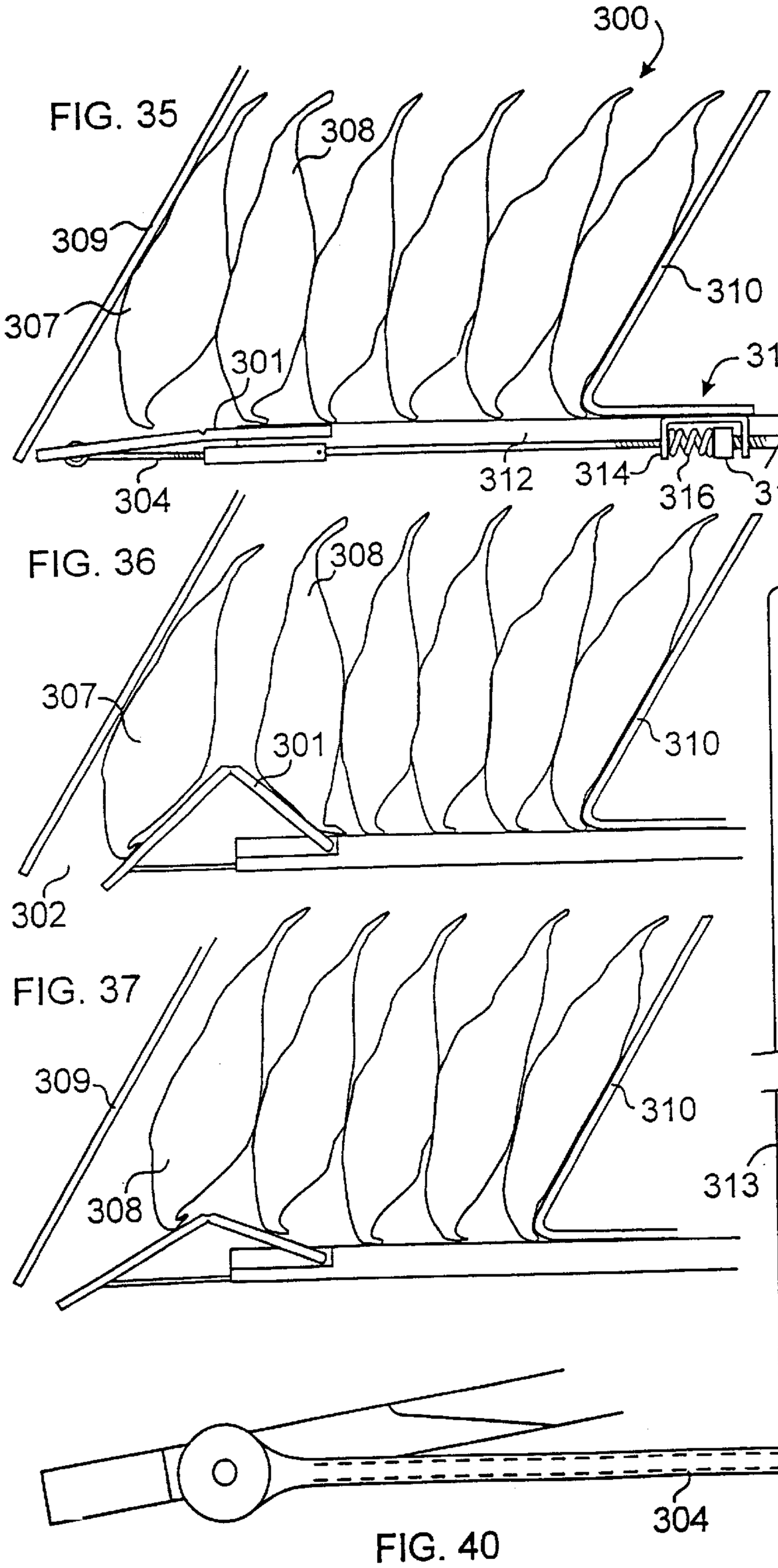


FIG. 36

FIG. 37

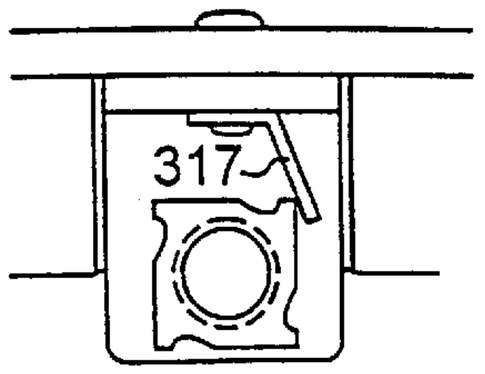
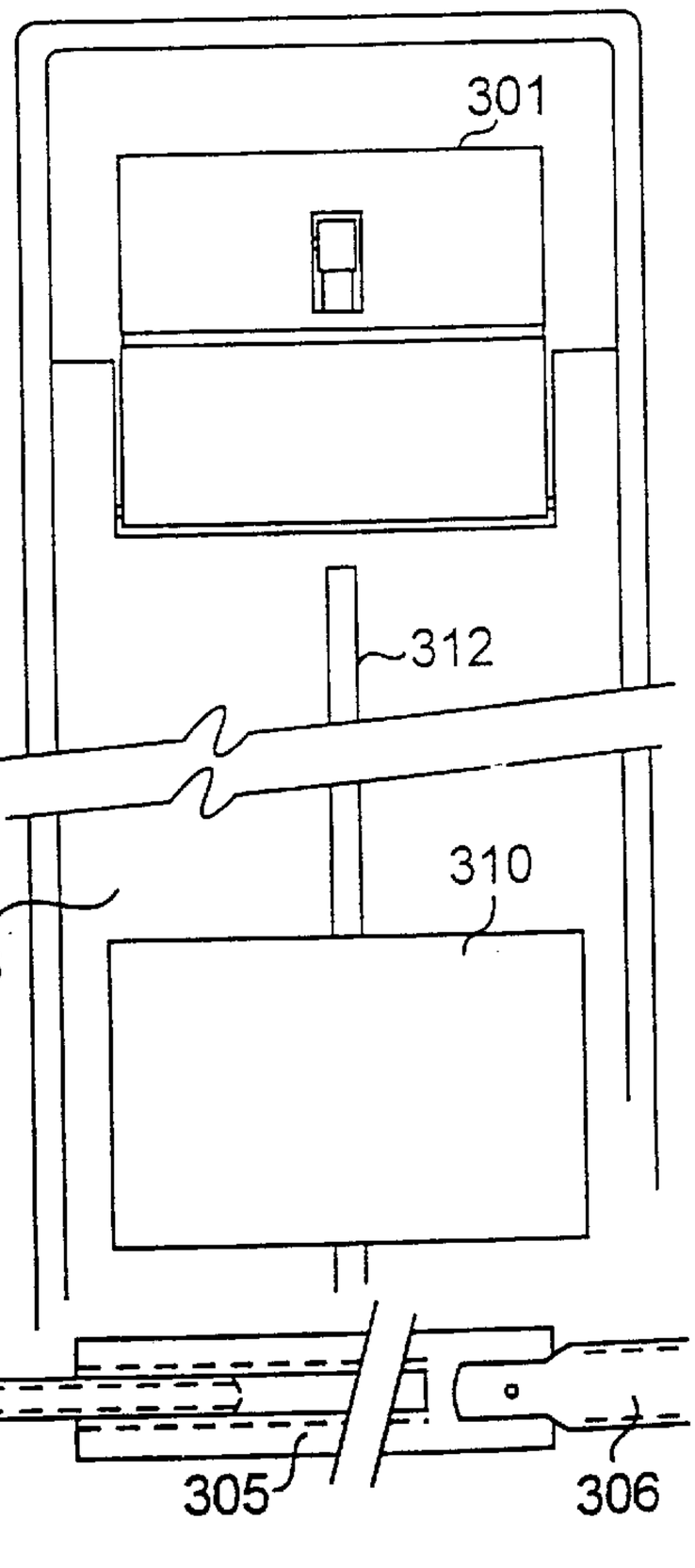


FIG. 38

FIG. 39



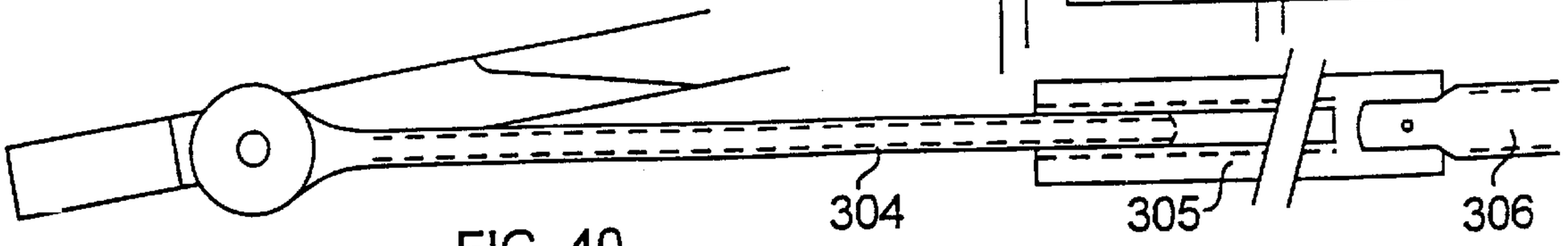


FIG. 40

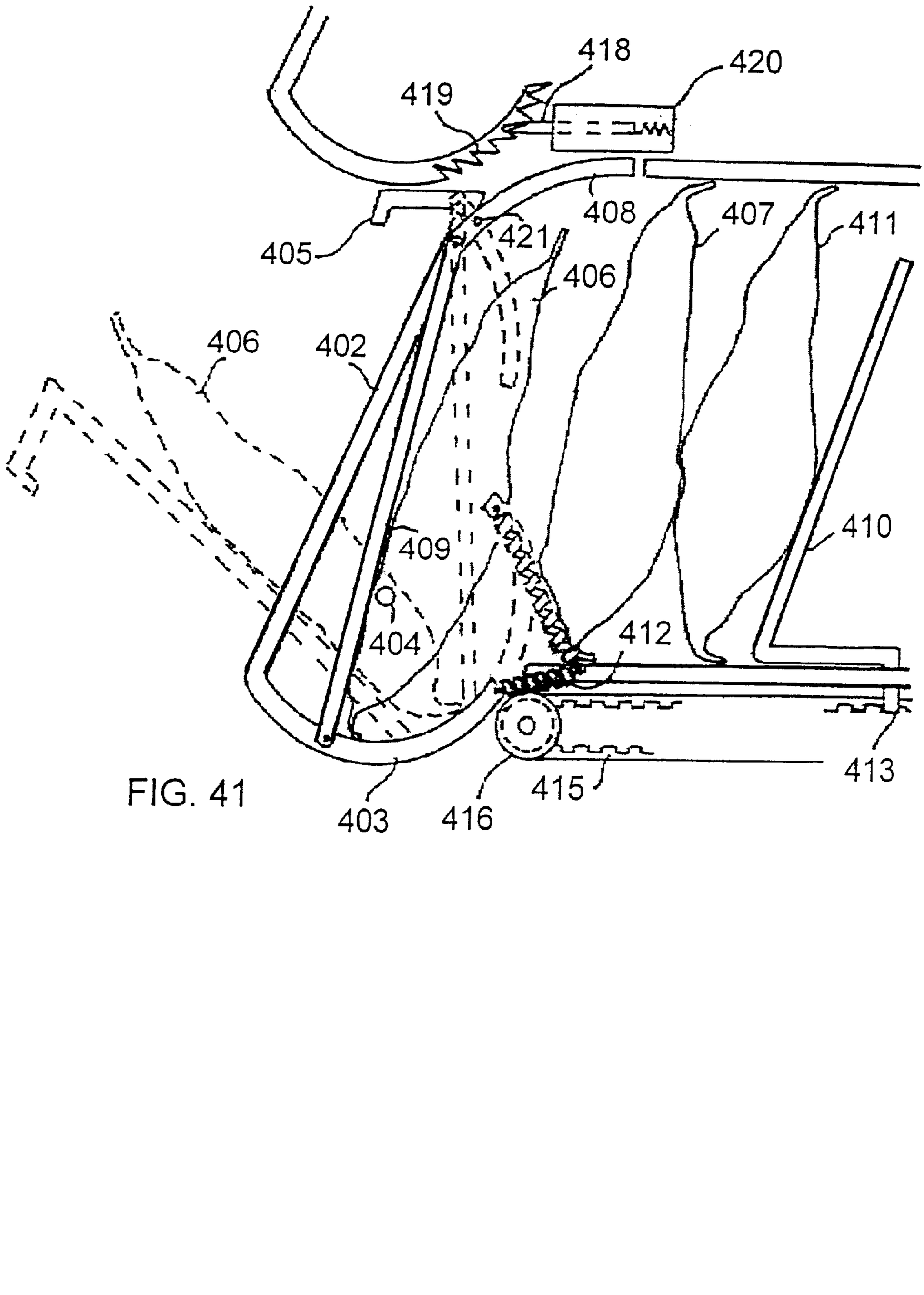

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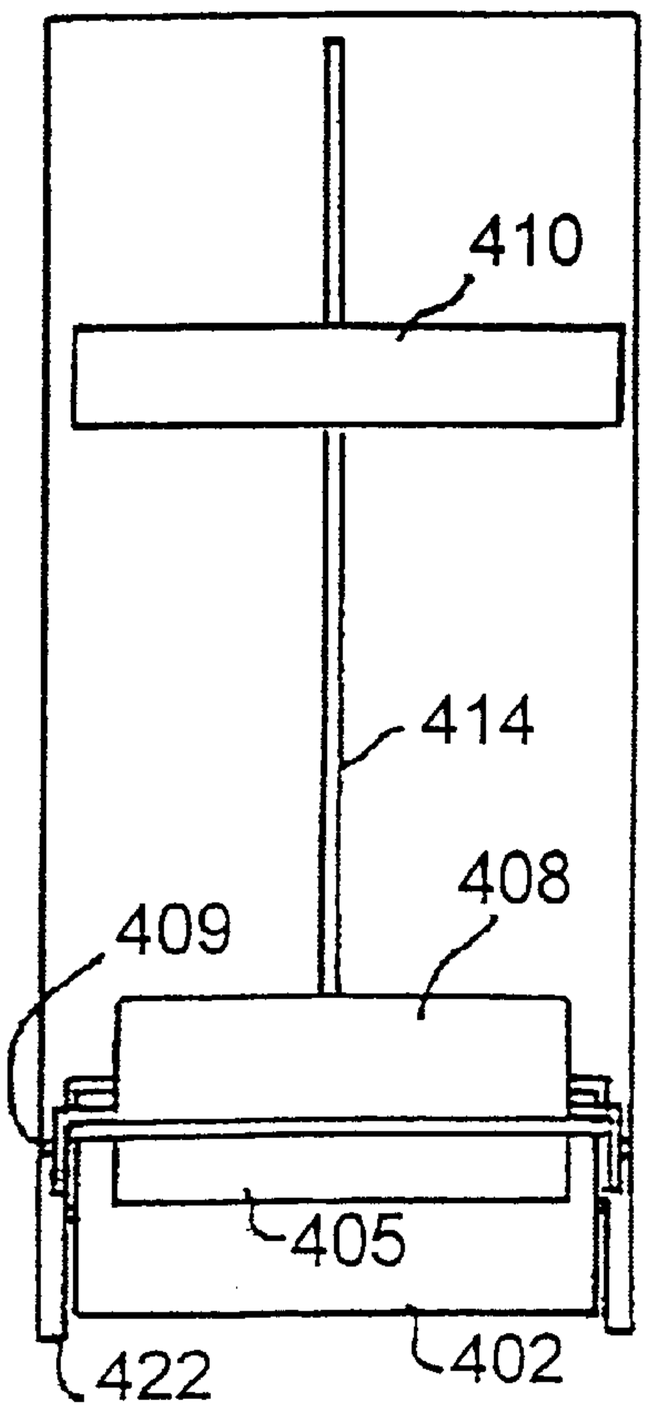
FIG. 41



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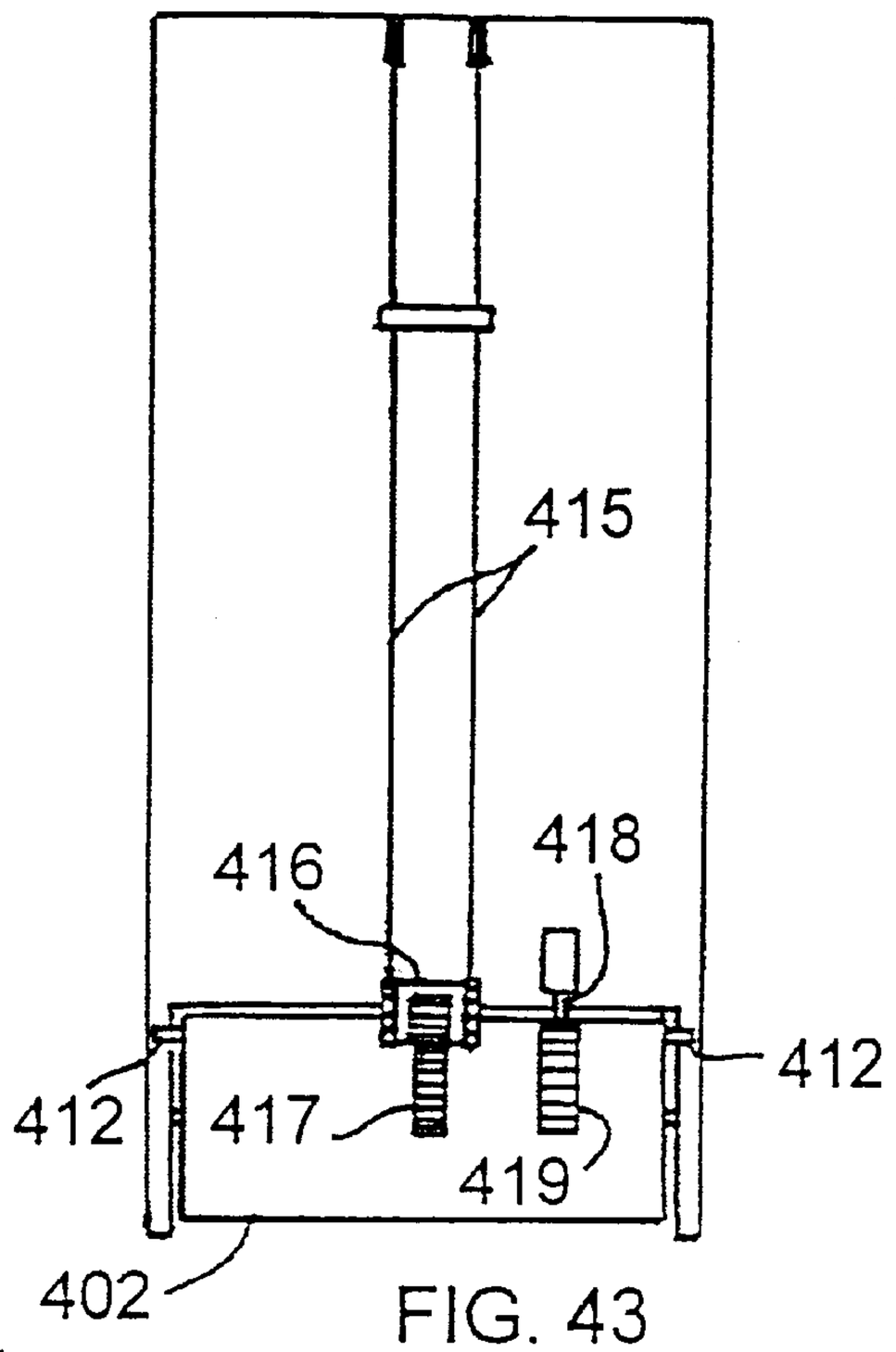

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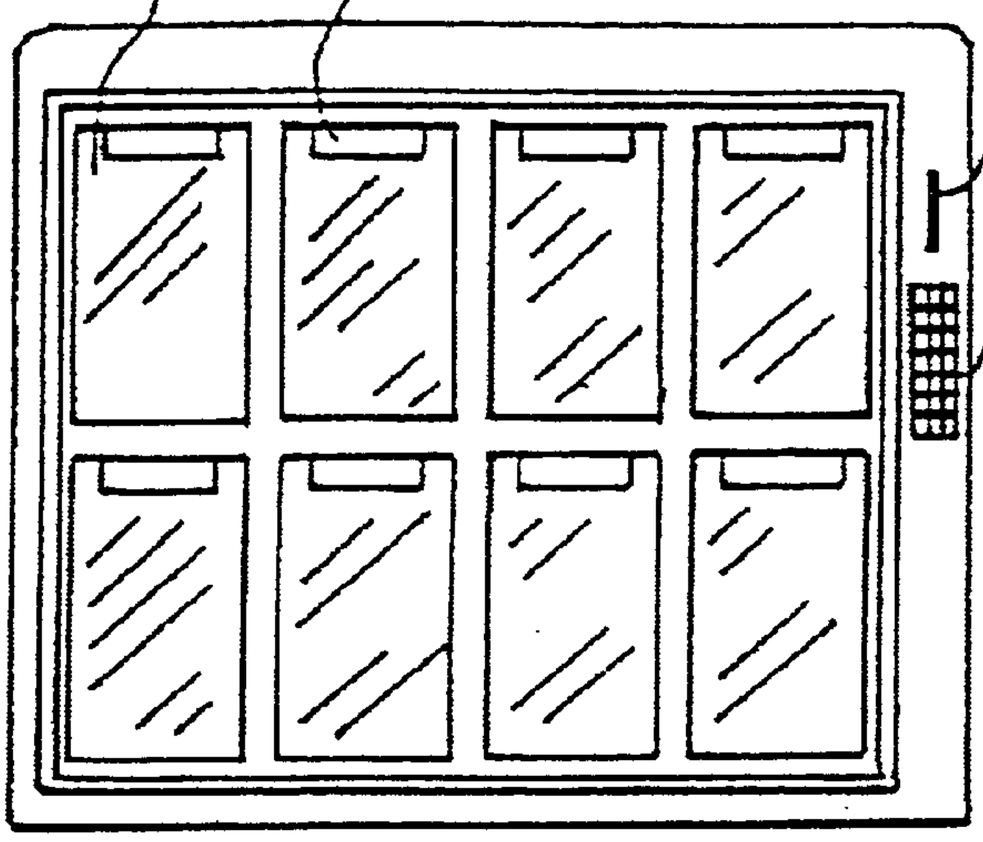
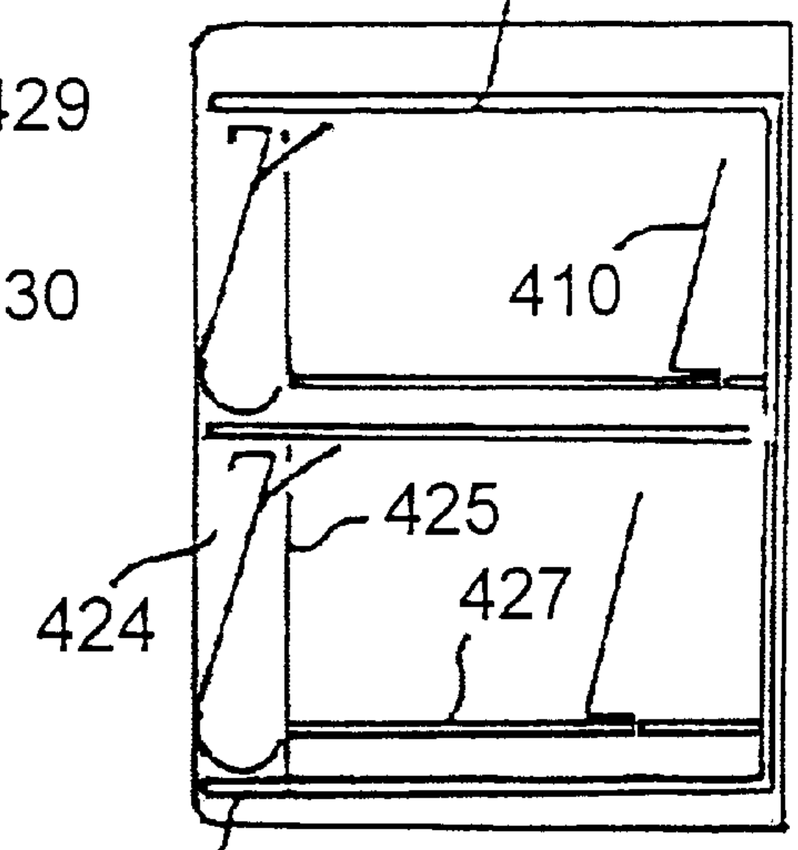


FIG. 44



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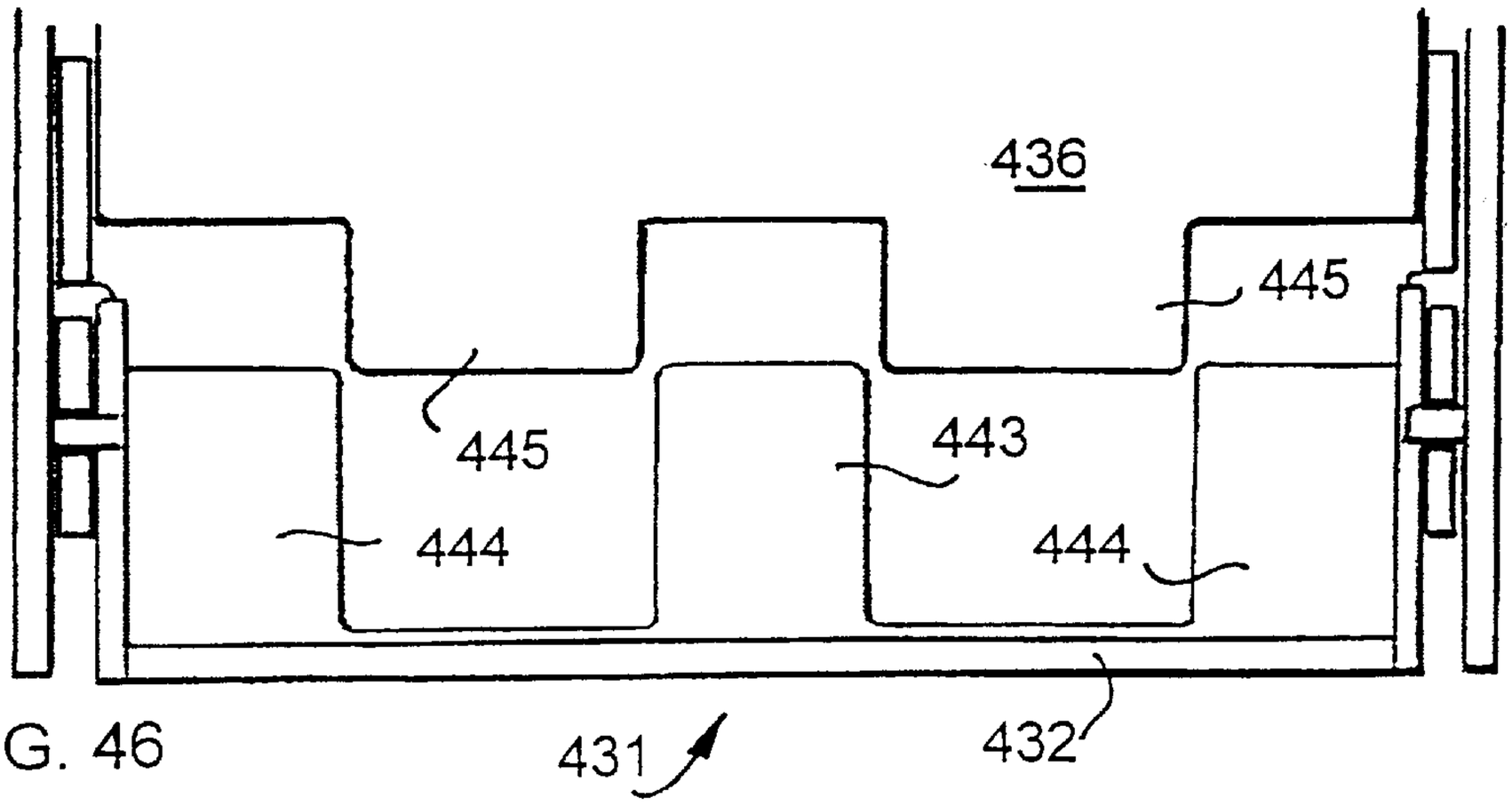

FIG. 46

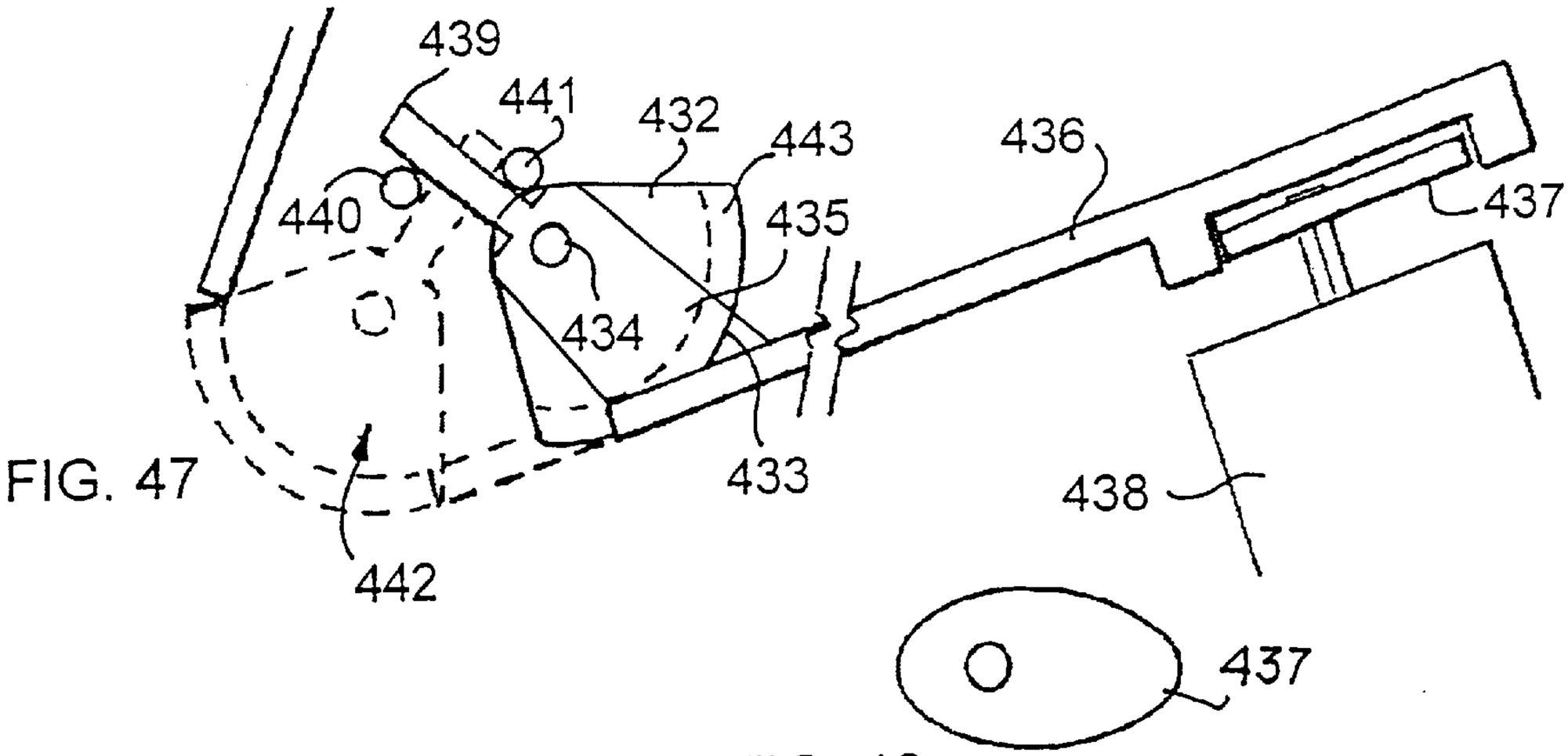

FIG. 47

FIG. 48

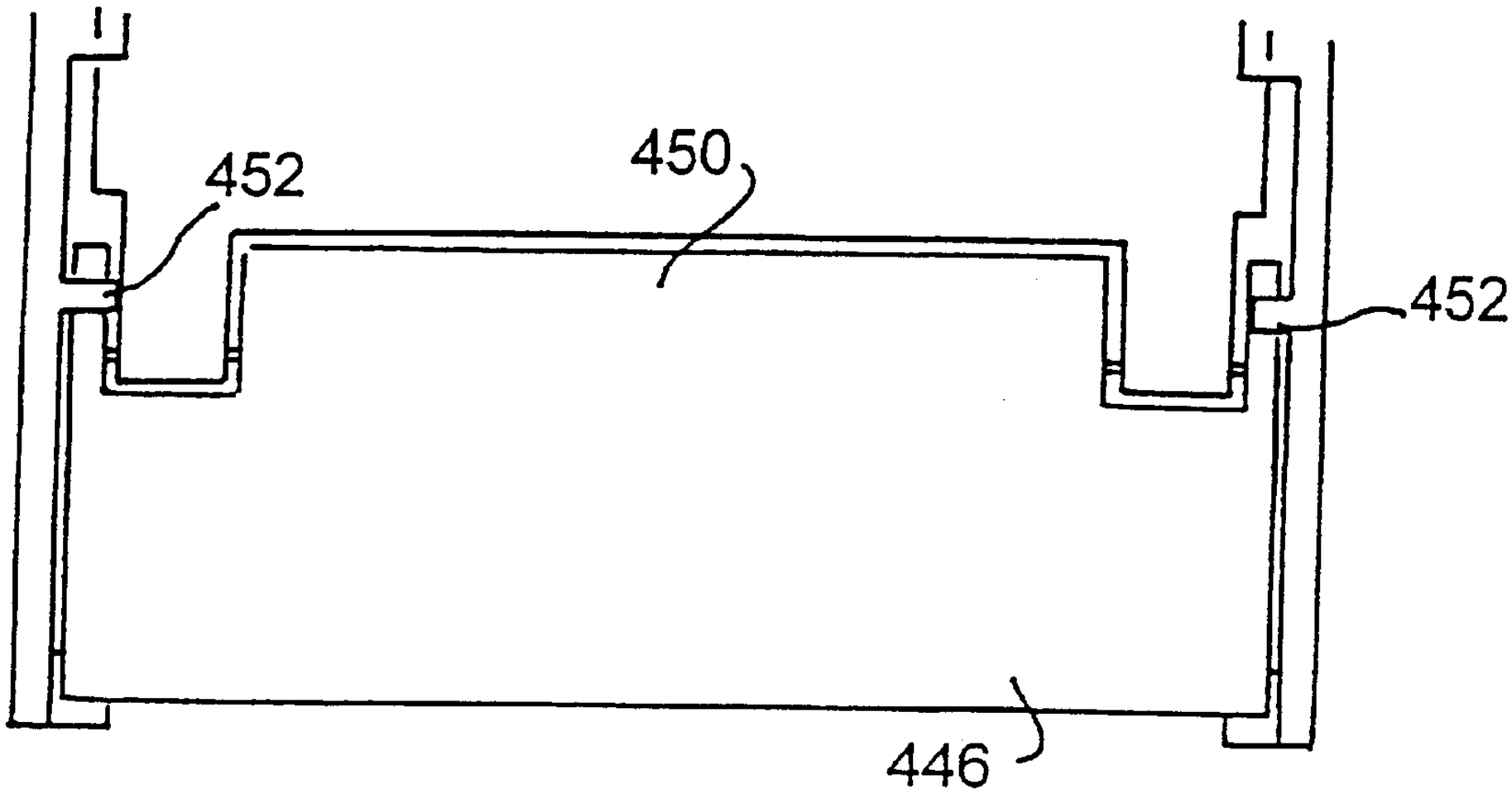

FIG. 49

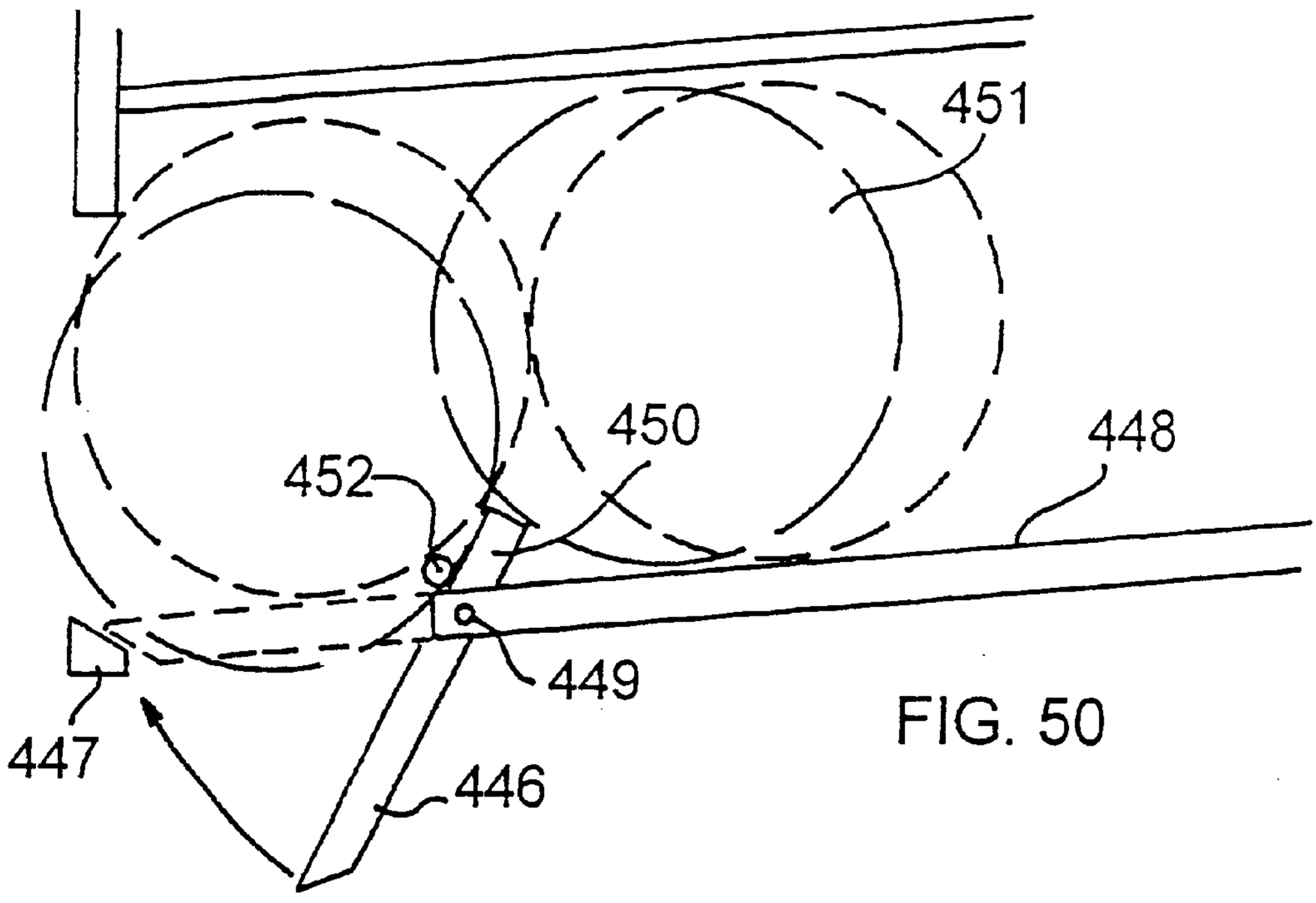

FIG. 50

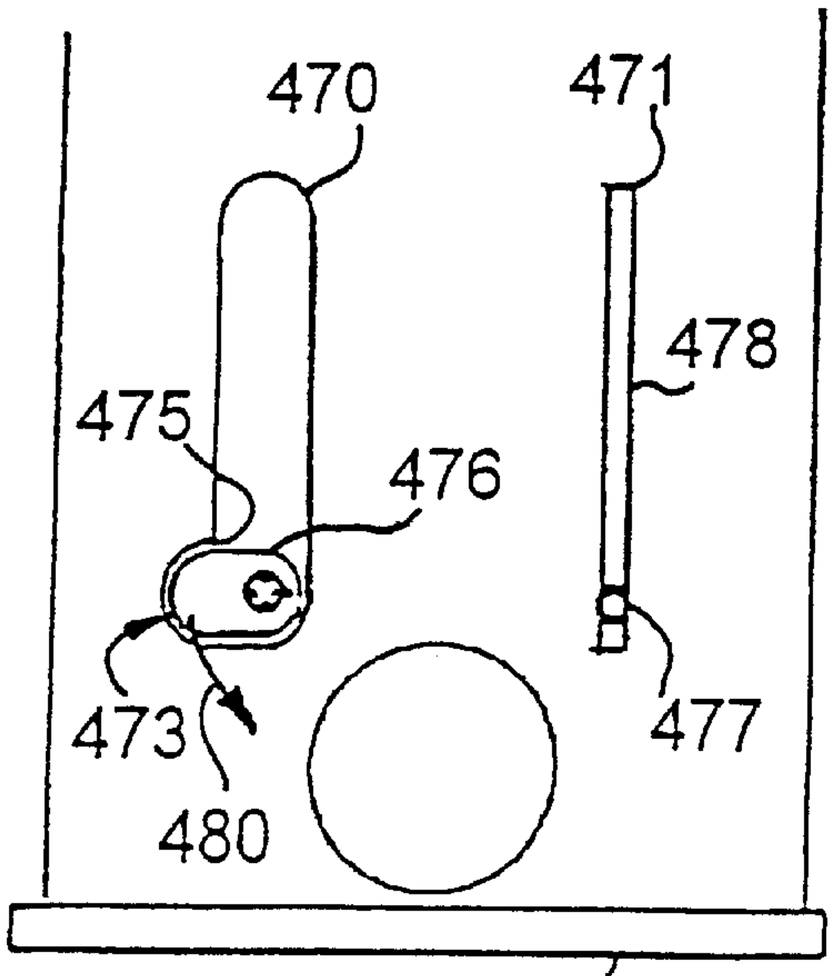

FIG. 53

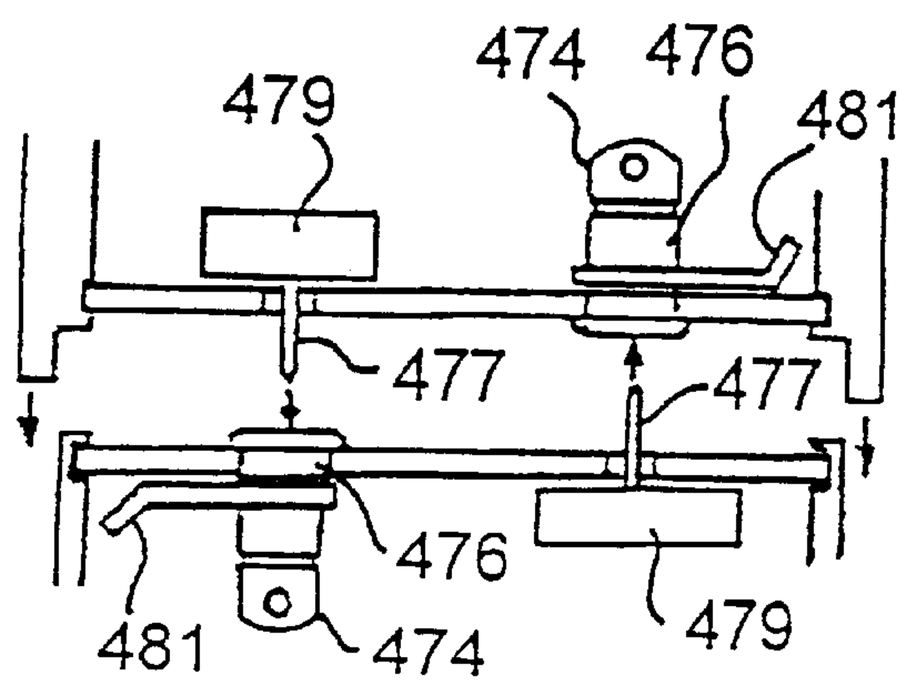

FIG. 52

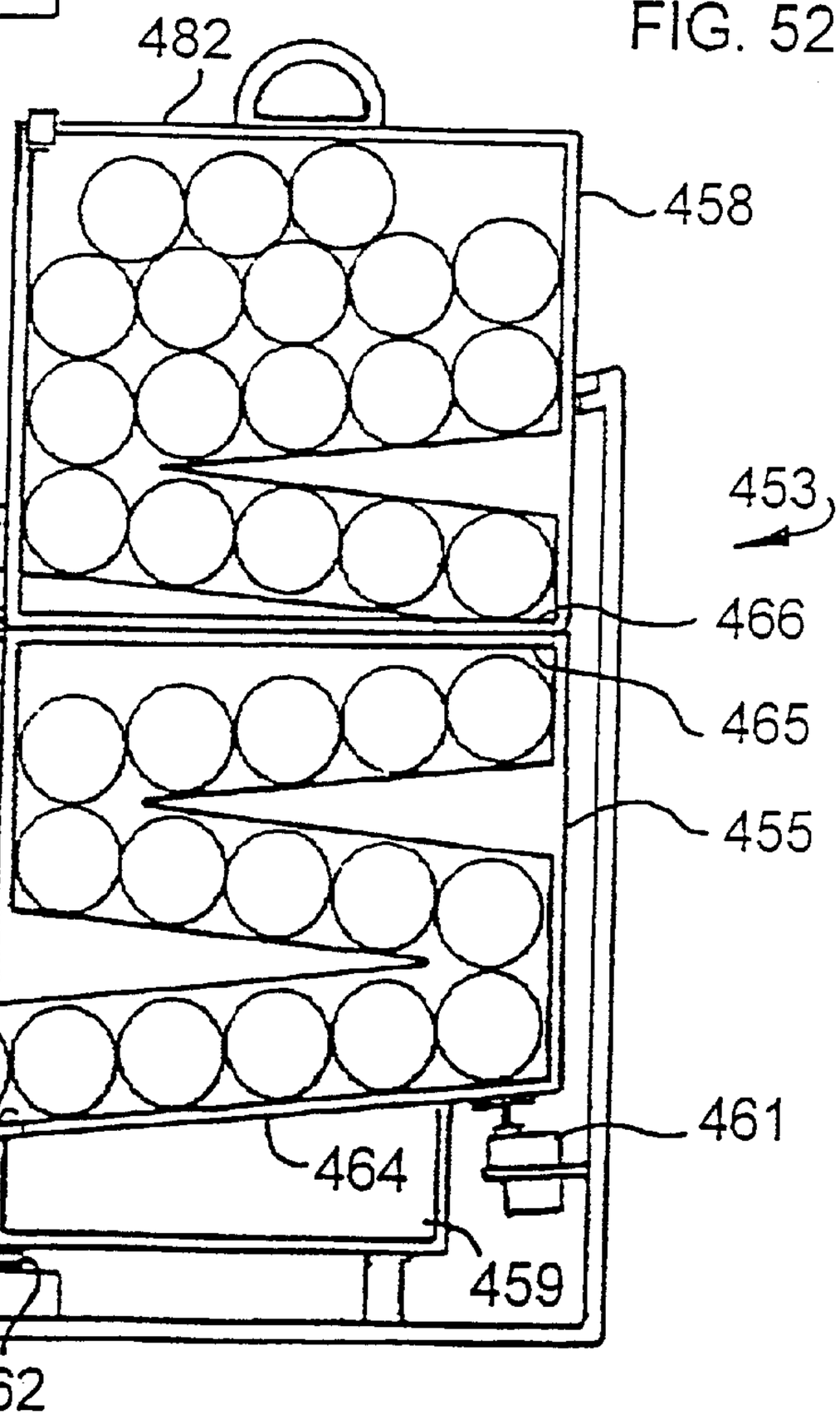

FIG. 51

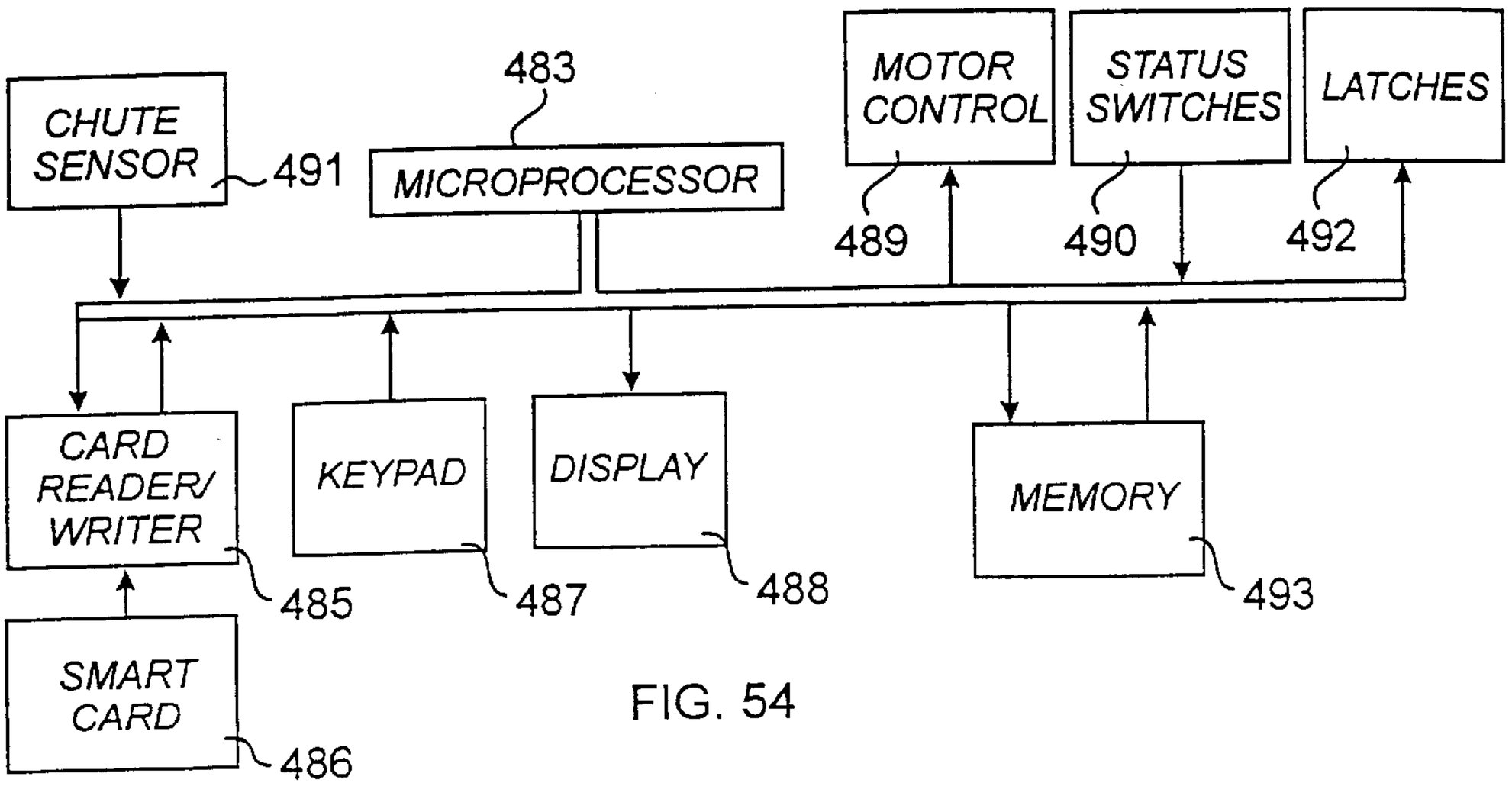
CHUTE SENSOR
491
483
MICROPROCESSOR
MOTOR CONTROL
STATUS SWITCHES
LATCHES
489
490
492
CARD READER/ WRITER
485
KEYPAD
487
DISPLAY
488
MEMORY
493
SMART CARD
486

FIG. 54

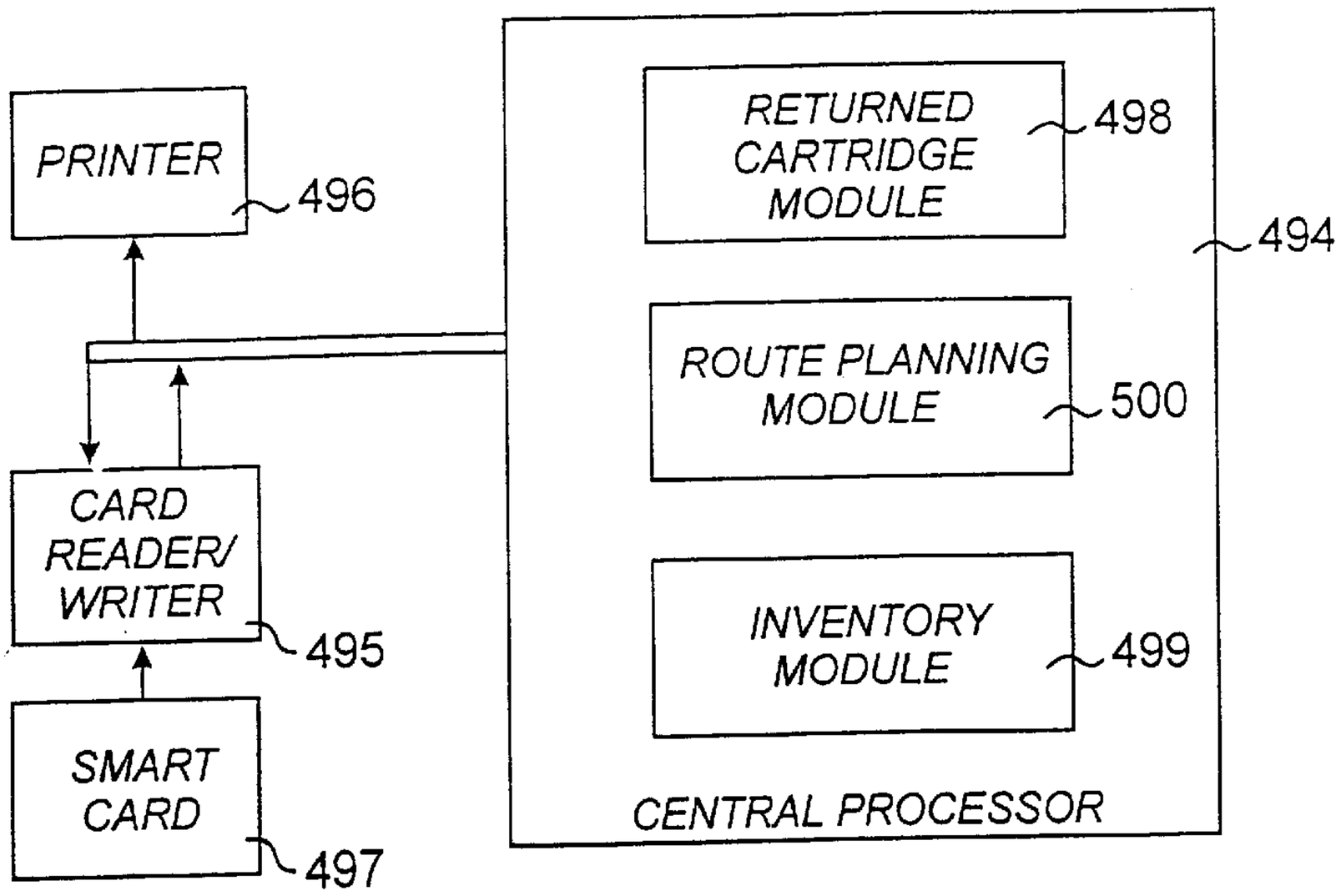
PRINTER
496
RETURNED CARTRIDGE MODULE
498
494
ROUTE PLANNING MODULE
500
CARD READER/ WRITER
495
INVENTORY MODULE
499
SMART CARD
497
CENTRAL PROCESSOR

FIG. 55

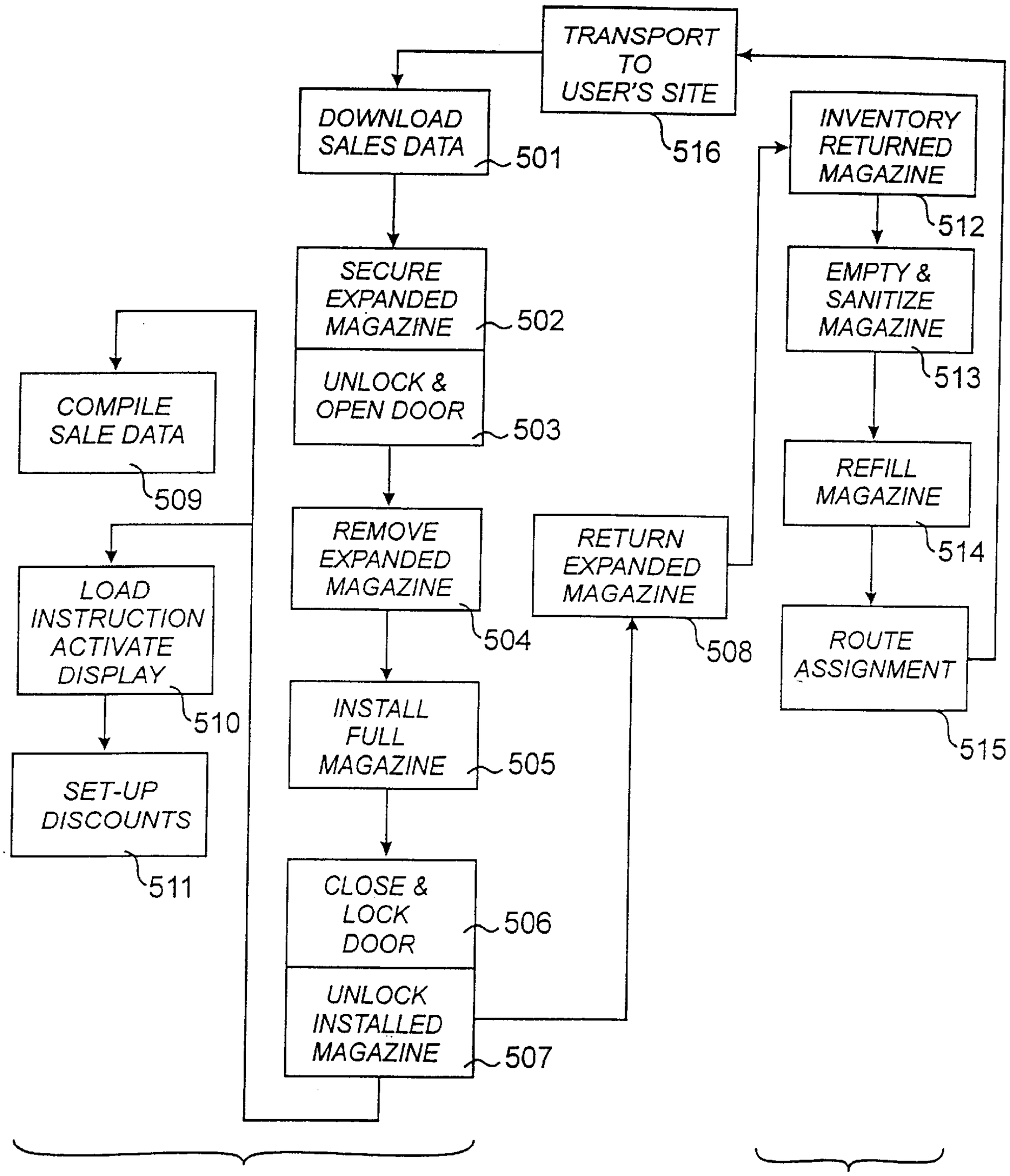
TRANSPORT TO USER'S SITE
516
DOWNLOAD SALES DATA
501
SECURE EXPANDED MAGAZINE
502
UNLOCK & OPEN DOOR
503
REMOVE EXPANDED MAGAZINE
504
INSTALL FULL MAGAZINE
505
CLOSE & LOCK DOOR
506
UNLOCK INSTALLED MAGAZINE
507
RETURN EXPANDED MAGAZINE
508
COMPILE SALE DATA
509
LOAD INSTRUCTION ACTIVATE DISPLAY
510
SET-UP DISCOUNTS
511
INVENTORY RETURNED MAGAZINE
512
EMPTY & SANITIZE MAGAZINE
513
REFILL MAGAZINE
514
ROUTE ASSIGNMENT
515
AT USER'S SITE
AT CENTRAL PROCESSING LOCATION

FIG. 56

CENTRALIZED MACHINE VENDING METHOD

PRIOR APPLICATION

This is a continuation-in-part of copending application Ser. No. 09/414,910 filed Oct. 8, 1999, a continuation-in-part of copending application Ser. No. PCT/US98/08,064 filed Apr. 15, 1998, a continuation-in-part application of Ser. No. 08/844,767 filed Apr. 22, 1997 and now abandoned. This is also a continuation-in-part of Provisional Application Ser. No. 60/104,006 filed Oct. 13, 1998.

FIELD OF THE INVENTION

This invention relates to vending machines, and more specifically to the type of vending machines found on jobsites capable of distributing pastries, small snack items and beverages.

BACKGROUND OF THE INVENTION

Conventional vending machines for pastries, candy bars, soda cans and other snack products must be able to hold a substantial inventory of goods so that they do not need to be serviced too often. Accordingly, they tend to be bulky and heavy and occupy about a square meter (10 square feet) of floor space, with a height of almost 2 meters (72 inches).

The reloading of such a machine is time consuming since items must be inserted one by one, and inventory of unsold items must be checked for expiration date, and, occasionally, replaced. Cash must then be collected and counted by the servicing employee. The good-holding stations must be cleaned of all oil and grease that may have oozed out of the packaged goods. These cumbersome procedures are time-consuming, labor intensive, and sometimes give occasion for pilferage and theft.

Conventional machines are not well-adapted to small job sites having 150 employees or less, because the profit generated at such a small site can not justify the labor cost of servicing the machines.

U.S. Pat. No. 4,236,649 Fellner et al. offers a partial solution to the above-mentioned problems by the use of a removable and replaceable magazine for the goods which can be loaded in the factory then used to replace an empty magazine or partially empty one. However, this type of magazine is relatively inefficient since it can hold only one item of goods in each location. Moreover, the coins need still be collected and counted on site. The same type of shortcomings characterize the vending machine disclosed in U.S. Pat. No. RE. 32,115 Lockwood et al. which uses a drum carousel to hold the goods to be sold. Although an empty carousel could be removed and replaced by a fully loaded one, each carousel station can only hold one item, and the cash must be handled separately. The inefficient designs of the above-devices inevitably leads to bulky vending machines which are not suitable for small locations.

The instant invention results from an attempt to palliate these various shortcomings.

SUMMARY OF THE INVENTION

The principal and secondary objects of this invention are to substantially reduce the time and expense involved in the refilling and maintenance of vending machines distributed at a plurality of locations over a given period, to reduce any losses due to pilferage of goods or conversion of payment currency by maintenance personnel, and reduce the health hazard occasioned by spillage of beverage and food items within the vending machines.

These and other valuable objects are achieved by the use of compact vending machines in which all the dispensable goods are held within a removable and substitutable magazine from which the goods cannot be extracted unless the magazine is installed within a locked vending machine or with the use of special key. Sets of magazines are filled in a central location then delivered to a plurality of vending machines along a predetermined route. At each location, the servicing of the machine consists essentially in opening the machine, removing the previously installed magazine, installing a fresh new magazine, securing the vending machine in the absence of any other maintenance, counting or inventory-taking of remaining goods, item by item or counting of any collected currency. Payments are made through debit cards sold by the vending machine operators to owners of locations for distribution to their employees and customers. Alternately, payments can be made by currency which once deposited into the machine are securely accumulated within the magazines and can only be retrieved at the central location with use of a special key. At certain locations, combinations of beverage and snack food item vending machines work together to deliver specially advertised combinations obtainable at a discount price. Magazines returned to the central location are emptied of any unsold goods and collected currency, cleaned, sanitized and refilled with fresh goods before being assigned to a route for distribution to a new location.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a front elevational view of the vending machine;

FIG. **2** is a top plan view thereof with the magazine withdrawn for removal;

FIG. **3** is a cross-sectional view taken along line **3**—**3** of FIG. **1**;

FIG. **4** is a back elevational view of the motor-holding module assembly;

FIG. **5** is a perspective view of the magazine with the transparent door in the shipping position;

FIG. **6** is a detailed cross-sectional view of the sprial rack-motor coupling mechanism;

FIG. **7** is an exploded view of the lock assembly;

FIG. **8** is a block diagram of the electronic units;

FIG. **9** is a flow diagram of the machine operation;

FIG. **10** is a perspective view of a multi-unit machine equipped with a scrolling display;

FIG. **11** is a front elevational view of a first alternate embodiment of the vending machine according to the invention;

FIG. **12** is a cross-sectional view taken along line **2**—**2** of FIG. **1**;

FIG. **13** is a cross-sectional view of a dispensing channel equipped with a good-centering insert;

FIG. **14** is a cross-sectional view of a can-dispensing mechanism;

FIG. **15** is a top plan view of a gating plate;

FIGS. **16**, **17** and **18** are cross-sectional views taken along lines **6**—**6**, **7**—**7**, and **8**—**8** respectively of FIG. **15**;

FIG. **19** is a detail cross-sectional view of a barrier mechanism;

FIG. **20** is a cross-sectional view of an alternate version of the dispensing channel;

FIG. **21** is a perspective view of a second alternate embodiment of a snack food dispensing machine;

FIG. **22** is a side cross-sectional fiew thereof;

FIG. **23** is a perspective view of the magazine;

FIG. **24** is a detail view of the locking mechanism;

FIG. **25** is a perspective view of a magazine;

FIG. **26** is a perspective exploded view of the cartridge locking mechanism;

FIG. **27** is a side view of a locking pin;

FIG. **28** is perspective view of a drive motor coupling mechanism;

FIG. **29** is a perspective view of a cartridge tray;

FIG. **30** is a cross-sectional view of an alternate beverage can distributing cartridge;

FIG. **31** is a cross-sectional view of an alternative gating plate and barrier drive mechanism;

FIG. **32** is a top plan view thereof;

FIG. **33** is a perspective view of an alternate package-feeding mechanism; and

FIG. **34** is an exploded view of a machine dedicated to beverage cans, minus the cabinet.

FIG. **35** is a side view of an alternate goods dispensing mechanism;

FIG. **36** is a side view of the mechanism during the gate-opening sequence;

FIG. **37** is a side view of the mechanism during the gate-closing sequence;

FIG. **38** is a cross-sectional view of the pusher drive mechanism;

FIG. **39** is a top plan view of the alternate dispensing mechanism;

FIG. **40** is a detail view of the gate actuator;

FIG. **41** is a side view of another embodiment of the dispensing mechanism;

FIG. **42** is a top plan view thereof;

FIG. **43** is a bottom plan view thereof;

FIG. **44** is a front elevational view of the whole vending machine;

FIG. **45** is a diagrammatical side view of the magazine and enclosure;

FIG. **46** is a top plan view of an arcuate dispensing gate mechanism;

FIG. **47** is a side view thereof;

FIG. **48** is a top plan view of an actuating cam;

FIG. **49** is a top plan view of yet another dispensing gate mechanism;

FIG. **50** is a side view thereof;

FIG. **51** is a side view of a beverage can dispensing mechanism and auxiliary magazine;

FIG. **52** is a front view of the magazine interlocking mechanism;

FIG. **53** is top plan view of a magazine gate;

FIG. **54** is a block diagram of the vending machine electronic control;

FIG. **55** is a block diagram of the central processing facility's data processing system; and

FIG. **56** is a block diagram of a magazine processing.

DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

Referring now to the drawing, there is shown a compact, counter top vending machine **1** housed in a molded plastic

and sheet metal cabinet **2**. A substitutable, quadrangular magazine **3** having a transparent front door **4** is securely held into the cabinet. The customer interface includes a message display **5**, a keypad **6** upon which the selection of a desired goods can be made, a currency-acceptor **7**, a magnetic-card reader **8** and a dispensing pocket **9**. The goods **10** and the numbers of the stations or cells **11** holding them can be observed through the transparent door of the magazine.

Each station **11** can hold a plurality of goods having the same sale price. Each station is identified by a letter (A–E) and a number (**1–5**) designating a column of stations. In each station **11**, a plurality of goods are held between the coils of a spiral rack **13**. These goods may be of various configurations or sizes. When a spiral rack is rotated, it acts as an Archimedes screw, and shifts the goods toward the access port **14** along the front of the magazine. The magazine comprises five layers of good-holding station units or trays **15**. It should be understood that the number of stations in each unit and the number of units in a magazine can be varied to accommodate different sizes and varieties of goods. Typically, small goods such as candy bars can be loaded on a five-station unit such as the one shown in the third row. Large items such as pastries and potato chip packs that require a larger station, can be loaded on units having four stations such as the one shown in the first, second, fourth and fifth rows.

The lower, lateral corner of the magazine **3** rests upon a pair of fully extendible drawer slides **16**, **17** for ease of installation and removal as illustrated in FIG. **2**. Elongated, shallow depressions **18**, **19** in the sides of the transparent door **4** form convenient pulling handles.

As more specifically illustrated in FIGS. **3** and **5**, the magazine **3** comprises a quadrangular box housing **20** in which the transparent door **4** is hinged by a set of pins **21** along the upper frontal edge. The lower part of the box is occupied by a currency receptacle **22**. The front, lateral edges **23**, **24** of the box **20** are slightly slanted downwardly and inwardly. The transparent door **4** has two pairs of lateral flanges **25**, **26** that overlap by approximately 9 centimeters (3.5 inches) the sides of the box. Accordingly, when the door **4** is held in a vertical position as shown in FIG. **3**, there is created a void space **27** between the access ports **14** of the station and the back face of the transparent door. Moreover, because of the slanted edges **23**, **24** of the cabinet, there remains an open gap **28** between the lower edges of the box and the transparent door. This gap matches an opening **29** on the front top part of the dispensing pocket **9**. The void **27** and the gap **28** provide a chute for the goods ejected by the spiral racks out of their respective stations.

When the magazine is installed in the cabinet, and the transparent door is kept in the above-described vertical position, a slot opening **30** in the right side of the coin receptacle is not covered by the right flange **25**, and is lined up with the base of a currency chute **31** which drops down from the currency-acceptor. However, when the magazine is extracted from the cabinet, the transparent door is slanted inwardly as more specifically illustrated in FIG. **5**. In that position, the right flange of the door **24** completely seals the slot opening **30**. A locking mechanism **32** is attached to a central, lower section of the transparent door **4** and passing through the currency box **22** cooperates with a keyed-pin **33** mounted on the back frame **41** of the cabinet.

The locking mechanism **32** comprises two telescopically engaged members **35**, **36** which are axially adjustable through the cooperative action of their male **37** and female **38** threads. At the distal end of each member is a lock **39**, **40**.

The locks act as clutches, whereby in the unlocked position, the threaded members **35**, **36** are free-spinning in relation to the locks, and in the locked position, the male threaded member **35** can be rotated by means of a key **32** providing that the keyed pin **33** is engaged into the inner lock **40**. Furthermore, once the cooperating members **35**, **36** have been extended by a counter-clockwise movement of the key **42**, the inner lock **40** cannot be separated from the keyed pin **33**. The outer lock **39** is rotatively and permanently secured to the transparent door **4** by a washer **43**. The inner lock **40** prevents the female-threaded member **36** from escaping from a pass-through hole in the back wall **34** of the magazine. The front lock is long enough to span most of the depth of the currency box receptacle **22**. The inner lock **40** is rotatively attached to the back panel **34** of the magazine box **20** by a nut **44**. Accordingly, it can be understood that the transparent door **4** of the magazine can only be placed in the vertical position illustrated in FIG. **3** when the magazine is fully inserted into the cabinet **2**. In that position, the magazine is safely locked into the cabinet by the attachment of the inner lock **40** to the keyed pin **33**. In order to remove the magazine from the cabinet, the service key **42** must be used to turn the male thread member **35** clockwise, thus pushing the transparent door's lower edge toward the lower edge of the currency receptacle, and effectively closing the slot opening **30** on the side of the currency receptacle. Once the magazine has been thus secured, the locking of the keyed pin **33** with the inner lock **40** is released and the magazine can be pulled out of the cabinet. It should be noted that the overhang **45** along the upper edge of the box effectively prevents access to the station when the cabinet magazine is out of the cabinet. It should also be noted that when the magazine is inserted into the cabinet, the top edge **46** of the transparent door **4** abuts the upper edge or lintel **47** of the cabinet. Accordingly, the transparent door cannot be pulled back further than the vertical position shown in FIG. **3**. In a warehouse or service center, a special key similar to the keyed pin **33** is used to disengage the two threaded members **35**, **36** in order to completely open the door **4** to give access to the stations.

In an alternate construction of the magazine, the box **20** is omitted. The station units or trays **15** are simply stacked upon one another and held together by self-aligning bolting pins to form the magazine.

In the back section of the cabinet, and for each row of good-holding stations, there is a good-extracting mechanism **49** that is engineered and positioned to contact the spiral rack of the good-holding units. As shown in FIGS. **4** and **6**, each goods-extracting mechanism comprises an electrical motor **50** coupled to a short spline **51** having at its distal end, a head **52** shaped and dimensioned to couple with the spiral rack mechanism of a good-holding station when the magazine is fully inserted into the cabinet. The shaft **53** of each spiral rack **13** is held in a bearing **54** that is mounted in the back plane of a station unit, and passes through a hole in the back plane **40** of the magazine box **3** where it comes into engagement with the spline head **52** of a corresponding motor **50**. Gangs of motors are mounted on motor-holding modules **55** secured to the back-mounting frame **41**. There is one motor-holding module for each station unit. The wirings of the motors in each module are brought to a pigtail connector **56** that mates with a corresponding connector **57** on the main wiring harness **58** leading to the electronic control unit **59** located in the rear of the cabinet base. Accordingly, modules of four or five motors can be quickly substituted for one another to match the composition of the station units.

The goods dispensing pocket **9** comprises an opening **60** leading to a opens space **61** immediately below the front end of the magazine. The opening **60** is closed by a triangular trapdoor hinged just above and behind the upper edge of the opening. Goods escaping from one of the spiral racks fall down the chute **27** into the dispensing pocket **9** where they can be retrieved by pushing the trapdoor **62**. It should be noted that the curved back **63** of the trapdoor tends to direct the goods toward the back end of the open space **61** where they do not interfere with the movement of the trapdoor. It should also be noted that when the trapdoor is pushed, it prevents access to the station by effectively closing the opening **29** in the roof of the dispensing pocket.

An electronic sensor **65** mounted near that opening detects the passage of the goods toward the distributing pocket. The output of the sensor is fed to the microprocessor **66** which constitutes the principal component of the electronic control unit **59**. The microprocessor typically includes a storage memory or equivalent recording medium. A fan **67** proximate the electronic control unit **59** is used to extract heat out of the cabinet. An infrared transceiver **68** provides access to the micro-processor data. This transceiver may be used by a service person to read useful information such as money paid, and goods sold using a type of hand-held downloading device well known to persons skilled in the art of data-processing, and provide a communication interface with various types of devices and networks according to so-called "Bluetooth" technology.

It can now be understood that once a user has made a selection by dialing on the keypad **6** the identification of the station holding the desired type of goods, the good-extracting mechanism servicing that particular station can then be activated to cause the goods most frontally located on the spiral rack to fall through the chute **27** into the dispensing pocket **9**.

As shown in FIGS. **8** and **9**, the operation of the vending machine is controlled by the microprocessor **66**. The motors are controlled by motor-control modules **69**, and the address-decoder **70**. The motor-control modules and the address decoder consist essentially of gated current drivers, that, under control of the microprocessor, feed the forward current to the two appropriate motor. A modem **71** provides the communication interface to the microprocessor via conventional phone carrier services and/or via the Internet. An LCD message display **72** which is part of display **5** on the front of the cabinet is used to suggest to the user an alternate selection when the selected items is not available and to give other notices as will be explained below. A light **73** is mounted in the front portion of the cabinet to illuminate the front opening of the stations.

As more specifically illustrated in FIG. **9**, the operation of the machine begins when the currency-acceptor detects that currency has been entered **101**, when a magnetic card has been inserted **102** or when an alternate form of payment such as an electronic transfer through the Internet, or out of a palm-held cash register. In case of payment by currency, once the correct amount has been received **103**, the system waits for the user to dial his choice of goods beginning with the letter corresponding to the proper row. In the case of a payment by magnetic card, the system first determines whether it is a credit card **104**. In that case, the card owner's identification is read **105**, and a credit check is initiated **106** via the modem **71**. If credit is refused, the user is so advised by the display **108** of a rejection message. If the credit card owner has sufficient credit, the system waits for the user's selection. If the card is not a credit card, the system assumes that it is a debit, or so-called "smart card", and reads the card

for the available balance **109**. If the balance is not sufficient to pay for one of the offered goods, a rejection message is displayed **108**. If that balance is sufficient to cover a purchase **110**, the system waits for the user's selections.

Once the user has selected a row **111**, that row identification is entered **112** into the microprocessor. The system then waits for the dialing of the appropriate column **113**. When the column is dialed, its identification is entered into the computer **114**. At that point, the corresponding motor is started **115** and, at the same time, a ten-second timer is also started **116**. If the timer expires **117** before the electronic sensor **65** detects the passage of goods into the dispensing pocket, the motor is stopped **118** and a message suggesting an alternate selection **119** is displayed. A twenty second timer is also started **120**. If that timer runs out **121** before a new row letter is dialed by the user, the magnetic card or the currency which has been introduced into the machine, is rejected **122**. If a row letter is dialed before the expiration of the timer **123**, the system proceeds with the entering of the row identification **112**; then the column identification **114** as previously described. If the electronic sensor **65** detects the passage of the goods **124** before the ten-second timer runs out, the motor is stopped **125**. In the event of payment by currency **126**, the currency is accepted **127** and dropped into the currency receptacle **22**. In case of payment by credit card **128**, the charge is confirmed to the bank **129** via the modem **71**. In case of payment by "smart card", the card is debited **130** by the price of the goods.

As disclosed in U.S. Pat. No. RE. 32,115 Lockwood et al. which patent is incorporated in this specification by this reference, the modem **71** can be used to communicate with a warehouse or other type of control center, in order to provide information about the status of the vending machine such as the amount of goods already sold, proceeds received including the exact amount of currency which is now stored in the currency receptacle **22**. The microprocessor can be programmed according to well-known techniques to initiate that kind of communication at preset intervals or specific times through a conventional phone network or via the Internet. The machine activity and sale data that is compiled by, and stored by the microprocessor can be downloaded on site by the service personnel on a recording medium that is returned to the central location along with the expanded magazine. Alternately, the microprocessor can respond to polling calls initiated from the control center. From the information thus received at the control center, the most appropriate time when servicing personnel should be dispatched to exchange the magazine of the machine can be determined. Moreover, the amount of money held in the currency receptacle, as well as the amount of goods remaining in the magazine are already known and can be verified upon receipt of the magazine. Any tampering or pilfering by the service personnel can thus be abated.

The preferred embodiment of the vending machine has a total height of 99 centimeters (39 inches), a total width of 84 centimeters (33 inches), and a total depth of 51 centimeters (20 inches), and an approximate weight of 36 kilograms (80 pounds), including an empty magazine. Such a vending machine can be easily transported and installed on a table or counter top where it occupies no more than 0.5 square meters (5.4 square feet).

In order to minimize the manufacturing, reconfiguring and maintenance of the vending machine, a combination of modular molded plastic and stamped metal components are used. The back and bottom part of the cabinet constitutes a single metal-stamped assembly. The back mounting frame **41** and the motor-holding modules are also made of metal-stampings. The cabinet consists of two symmetrical and similar molded plastic half-shells joined in the middle of the cabinet. The transparent door and the magazine itself are also made of molded plastic.

The use and profitability of the vending machine can be substantially increased by combining it with a programmable scrolling display of the type disclosed in U.S. Pat. No. 5,493,802 Simson, which patent is hereby incorporated in this specification by this reference.

As illustrated in FIG. **10**, a scrolling display **131** is preferably incorporated into the door **132** of an auxiliary vending machine unit **133** that dispenses only beverages. Such a machine is disclosed below and illustrated in FIG. **51**. The beverage-dispensing machine does not require a transparent door to view the various available items. The type of available beverages can be indicated on a picture sign **134** located near the distribution pocket **135**.

The selection of the beverage and payment therefor is done on the control panel **136** and by using the card slot **137** located on principal machine **138**. A simple umbilical cable **139** connects the two machines. A wide variety of enticing messages can be carried on the scroll **140** of the display. The messages on the scroll are exposed for several seconds per frame in a continuous mode of operation. Some messages may tout special packages combining a food item from the principal machine with a drink from the auxiliary machine at a reduced price. The display can also be programmed to match the message with the time of the day. Sandwiches and puddings may be emphasized around lunch or dinner time while candies and cookies are promoted during coffee breaks. The operation of the scrolling display is controlled by the microprocessor **66** operating under well-known programming routines. Entry of program commands can be made through the card reader **8** or via the modem **71**.

In this embodiment of the invention, the principal machine **138** has a transparent door **141** that is hinged to the main enclosure **142**. The magazine **143** has a scrolling tambour door **144** that securely closes upon any attempt to unlock the door **141**, and automatically opens once the magazine is safely installed into the machine and the transparent door **141** has been locked. The tambour mechanism is substantially similar to the one used in the scrolling display, except that the scroll is constituted by a transversally rigid curtain such as the one used in connection with conventional roll-top desks.

An alternate embodiment **201** of the invention illustrated in FIGS. **11–18** also features a merchandise and currency cartridge **202** which is removable from the enclosure cabinet **203**. The cabinet, preferably made of molded plastic, includes a transparent front door **204** secured to the cabinet by a top horizontal hinge **205** and a bottom lock **206**. The cartridge **202** is mounted on a pair of slides **207** secured to the lower section of the cabinet.

With the transparent door **204** open, the magazine can be pulled out and lifted from its supporting slides.

On a front right section of the cabinet is a keypad **208** upon which the user can dial his selection, a card slot **209** for accepting payment by bank card or enter and down-load data on a so-called "smart card", and a coin slot **210** for accepting cash payments. A large opening **211** in the lower section of the door leads to a dispensing pocket **212** into which purchased items are dropped. In the lower back section of the cabinet is a refrigerating unit comprising a compressor **213** and a condenser **214**. Attached to a backboard **215** is a electronic module **216** and a series of motor assemblies **217**. A light **219** mounted in the door **24** illuminates the entire

machine. The cartridge comprises three or more merchandise-holding trays **219**, **220** and **221**, and a triangle-shaped currency receptacle **222**. The currency receptacle forms the base of the cartridge and its lower lateral ledges rest upon the slides **207**. The trays are stacked upon one another and upon the slanted top of the currency receptacle. The trays have downwardly slanted floors and tapering front faces **224** which are vertically aligned exposing a marginal front section of their underside which forms the dispensing openings **225** for the stored merchandise. The trays have approximately the same width. Accordingly, and due to their slanted orientation, a back section **226** of each tray's underside is also exposed. A cover **223** is used to seal the upper tray **219**. The cover, the trays and the currency receptacle are secured together by screws engaged in sets of lugs **227** along their respective lateral edges.

A cartridge may combine trays configured to hold different types and sizes of merchandise. For the sake of illustation, the preferred embodiment is shown having a top tray **219** configured to hold small items such as candy bars and cookie packages. The intermediary tray **220** is configured to hold bags of snack foods such as chips or pretzels. The bottom tray **221** is configured to hold standard beverage cans. Each tray is divided into four or eight rows, each row is equipped with its own dispensing mechanism. Typically, a 60 centimeters (24 inches) wide cartridge can accommodate four rows of beverage cans or snack food packages, and eight rows of candies or cookies. Each row in the beverage can holding tray **221** comprises two layers of cans fed to the same dispensing gate. It should be noted that the number of layers of cans can be increased as shown in FIG. **30**, and that an entire cartridge devoted uniquely to beverages could comprise a single tray divided into four rows. As shown in FIG. **13**, a row initially configured for large snack food bags, can be modified by addition of an insert **231** to accommodate smaller items **232**.

A sliding gate member **233** lining the bottom of each row has a front section that closes the dispensing opening **225**. At the opposite end of the gate member, a toothed rack **234** is engaged by a pinion or gear **235** driven by an external electrical motor **236**. A gang of motors, one for each row, is mounted on the motor assembly **217** secured to the back-board **215**. Accordingly, each tray requires a motor assembly board. If the tray configuration within the cartridge is changed, the arrangement of the motor assembly in the back of the cabinet must be reconfigured accordingly. As shown on FIG. **28**, when a cartridge is pushed into place in the cabinet, a flat key element **237** mounted at the end of the shaft **238** which drives the pinion **235** engages into a slot **239** cut into a head **240** capping the motor shaft **241**. The motor can then be energized to drive the gear in either direction to open or close the dispensing opening **225**.

As will be explained below, when the cartridge is being transported, all the dispensing openings are closed. Accordingly, the keys **237** can be oriented to always face the slot **239** in the motor shaft head **240**.

In each tray, the goods are laid against the back of the front face **224** and are kept in this position by a triangular pushing block **242** inserted against the back face of the last item in a row. As the goods are dispensed one by one, the blocks keep sliding along with the remaining goods toward the front face **224** and the dispensing opening **225**.

The pushing block is not necessary in connection with smoothly or roundly-shaped good which can slide toward the dispensing gate in the absence of any applied downward force other than gravity.

To make certain that no more than one item is dispensed with every movement of the gate member **233**, a barrier **243** rises between the item being dispensed and the one next in line in synchronization with the backward movement of the sliding gate member **233**. The barrier passes through a quadrangular window **245** cut into the forward end section of the sliding gate member **233**.

In the beverage can tray **221**, the barrier is constituted by a nylon plate **246** creased along three parallel lines to form three hinges **247**, **248** and **249** articulating two rising panels **250** and **251** forming the barrier **243**. The forward end **252** of the barrier is secured into the forward end of the window **245**. The back end **253** is connected to a trapezoidal nylon pushbar **254** running within a similarly-shaped channel **255** along the length of the gating member **233**. The back end of the pushbar is shaped into a toothed rack **255** which also engages the pinion or gear **235** in a diametrically opposed position to the rack **234** of the gate member itself. Accordingly, it be understood that when the gate member **233** is withdrawn toward the back of the tray to open the dispensing opening **225**, the pushbar **254** moves in the opposite direction to cause the barrier to rise.

As illustrated in FIG. **20**, in order to prevent the heavy weight of the cans **256** from bearing upon the gate member **233** and impeding its movement, the gate member is nested in a depression **257** in the center of the channel floor **258**. The edges of the can thus ride on the remaining shoulders **259** on the lateral edges of the channel.

The second alternate embodiment **260** of a snack food distributing machine illustrated in FIGS. **21–24**, is basically similar to the first embodiment **1** illustrated in FIGS. **1–9**. However, the transparent front door **4** extends down to cover the good-dispensing pocket **9** and includes the opening **60** through which the goods can be reached. Moreover, the magazine **3** is secured by a guillotine-type cover plate **261**. that can be removed through a slot **262** in the roof of the cabinet **2**. A pair of notches **263** cut in the right edge of the cover plate are normally engaged by the bolts of two locks **264**. The locks can be opened with the use of a special key kept at the central location where magazines are processed. The locks are activated by use of a smart-card. The card carries an identification number including the current date. The machine microprocessor maintains its own calendar. When the identification number and date read from the smart-card matches the ones stored into the microprocessor, the locks are activated. A lost or stolen card can only be used for the remainder of the day without becoming obsolete. The smart-card must be updated daily through special equipment at the central processing location. Each lock **264** comprises two interlocking modules. The first **265**A mounted against the outer wall of the magazine **3** next to a cover-plate holding channel **263**A. A second module **265**B is mounted against the inside wall of the cabinet **2**, and interconnects with the first module when the magazine is inserted into the cabinet. Each module includes a spring-biased bolt **266**A, **266**B that can only be retracted under the pull of a solenoid. The bolts of the first module engage the cover-plate notches **263**. The bolts of the second module engage mortises in the edge of the door **4**. The cover-plate **261** cannot be removed when the door is opened. The door cannote be opened if the cover-plate is not locked into place on the magazine. The door cannot be locked if there is no magazine in the cabinet. These conditions can be easily implemented by use of contact sensors and simple logic circuits.

In the embodiment of **201** of FIGS. **11–18**, in order to lock all the gating members **233** in their most forward position where they close the dispensing openings **225**, a locking

mechanism is provided in each tray as illustrated in FIGS. **25–27**. The locking mechanism comprises a locking bar **267** which runs along the back lower corner of each tray, and has a series of lugs **268** positioned to slide behind the back end of each rack **234** in the locked position. In the unlocked position, the lugs can be moved to fall within the gap **269** left behind the pinion **235**. The left end of the bar passes through the tray wall and into a lock **270** mounted against the lower back corner of the left face of the tray. The lock comprises a excentric cam **271** engaged into a circular bore **272** at the end of the bar **267**. On the front end of the lock, a lever **273** can be actuated by the service personnel. The back end of the lock comprises a tumbler assembly which is configured and aligned to be engaged by a key **275** permanently secured to the backboard **215** of the cabinet when the cartridge is fully installed into the cabinet. The tumbler assembly **274** prevents the lever **273** from being manipulated if the key **275** is not engaged. Moreover, in order to separate the tumbler assembly from the key, the mechanism must be put in the locked position. It can now be understood that when the cartridge is out of the cabinet all the dispensing openings **225** are closed and the levers **273** cannot be manipulated without the use of a key similar to the one installed into the machine. Once the cartridge is installed into the machine and the locking mechanism has been released by manipulation of the levers **273**, the dispensing openings can only be opened by operation of the driving motors **236**.

The coins fed into the coin slot **210** are led through a chute to a small aperture in the back of the currency receptacle **222**. A sliding gate controlled by the same type of locking mechanism that secures the trays, closes that aperture when the mechanism lever is manipulated to release the cartridge. Accordingly, when the cartridge is out of the magazine, the coin receptacle cannot be accessed through that aperture.

A locked door **277** is provided for emptying the currency receptacle at a service center. An alternate embodiment **278** of the gate member and barrier driving mechanism, is illustrated in FIGS. **31** and **32**, relies upon a threaded rod **279** driven by an in-line motor **280** instead of a rack-and-pinion assembly. The rod **279** engages a square nut **281** captured by a cavity in the gate member **233**. The distal end **282** of the rod engages a bore in the back edge of the barrier **243**. When the motor is turned in one direction, the progress of the rod through the square nut draws the gate member away from the dispensing opening, at the same time pushing against the back side of the barrier.

In the alternate embodiment of the feeding mechanism illustrated in FIG. **33**, the goods are held in separate packs **284** suspended to a rotating threaded rack **285** through pierced tabs **286**. The aperture in each tab is axially and slidingly engaged upon the threaded rack **285** so as to move toward the dispensing opening when the rack is rotated. The rack is driven by the same motor that controls the gate member **233**. Thus, the goods can be precisely delivered and dropped right above the dispensing opening in synchronization with the movement of the gate member.

The beverage can dispensing machine **287** illustrated in FIGS. **30** and **34** uses a series of side-by-side mounted can cartridges **288** rather than the stacked-up trays of the earlier described embodiment of the invention. Each cartridge has a plurality of rows feeding the single dispensing opening as shown in FIG. **30**.

Each cartridge seats on a pair of slated support rails **289** and a front bar **290**. The front bar mounts a series of pin keys that cooperate with lock assemblies **292** in the bases of the cartridges to secure the cartridge within the cabinet. A similar locking mechanism **293** is provided for the coin receptacle **294**. Loading of the cartridges can be done through the dispensing opening or through a removable panel in either the top, side, or back wall. The slant of the rows in the beverage tray or cartridge is preferably between 10° and 20° from the horizon.

In snack food packages or candy bar rows, the slant is preferably between 20° and 30°.

A 60 cm (24 inches) wide, 75 cm (30 inches) high and 55 cm (22 inches) deep magazine can accommodate approximately 96 candy bars, 32 chip bags and 72 cans.

A 15 cm (6 inches) wide, 60 cm (24 inches) tall and 55 cm (22 inches) deep cartridge can hold 32 cans, for a total machine capacity of 128 cans.

Illustrated in FIGS. **35–40**, is an alternate design for the dispensing control which does not rely on gravity to move the items toward the gate. It uses instead, a pushing mechanism synchronized with the gate opening.

In the dispensing mechanism **300** a folding gate **301** is mounted across the dispensing slot **302**, and is driven by a backboard-mounted motor **303** by means of a spline and threaded rod assembly. The forward end of the folding gate **301** is secured to a threaded spline **304** having its opposite end engaged in a threaded sleeve **305**. The opposite end of the sleeve is fixedly attached to the end of a threaded rod **306** driven by the motor **303**. Thus, when the motor is activated the folding gate **301** is withdrawn, forming a barrier between the item **307** first in line to be dispensed and the next one **308** as illustrated in FIG. **37**. The items to be dispensed are aligned and pressed against the front face of the dispensing channel by a pusher plate **310** which has a driving mechanism **311** riding in a longitudinal slot **312** in the floor **313** of the channel. This driving mechanism comprises a U-shaped bracket **314** having it ends engaged by the threaded rod **306**. Captured between the legs of the bracket are a square nut **315** and a coil spring **316** both also engaged by the treaded rod **306**. A spring leaf plate **317** allows the nut to follow the rotational movement of the rod **306** during clockwise rotation of the rod, but causes the nut to progress toward the distal end of the rod opposite the motor **303** when the motor direction is reversed to close the dispensing gate **301**. This movement of the square nut **315** apply pressure through the spring **316** against the distal end of the bracket **314** causing the pusher plate **310** to shift the items toward the dispensing slot as illustrated in FIG. **37**. The coil spring **316** against which the nut pushes, is provided to accommodate small differences in the sizes of the items and to avoid crunching goods such as potato chips under the action of the pusher plate **310**. Accordingly, the pushing movements occurs only after one item has been dispensed and the next in line must be positioned over the folding gate **301**.

It should be noted that by changing the position of the hinge on the folding gate and barrier, items of a different thickness can be quickly accommodated. Alternately, a transparent insert can be applied against the back side of the front face to reduce the width of the dispensing slot. Since the folding gate has a very light duty cycle and is not subject to any particular stress, it can conveniently be implemented with a nylon or other synthetic sheet of material that has been appropriately creased to form the hinge. The attachment of the gate elements to the spline and to the floor of the channel can be accomplished by simple snapping nib-and-cavity mechanisms. Accordingly, the gate barrier can be quickly replaced for adjustment to a new height and size or to replace it in case of excessive wear. Since the customer cannot reach the dispensing slot, it is not necessary that the

folding gate span the full width of the dispensing slot. Closing the central third of the slot may be sufficient. All the moving components of the system can conveniently be made out of nylon or similar self-lubricating and rust-proof material.

In another alternate embodiment **401** of the vending machine illustrated in FIGS. **41–45**, the driving power for the good-dispensing mechanism is provided by the user's opening of one of the pocket-doors **402** at the front of each good-holding station.

Each pocket-door as a inwardly curved bottom section **403** forming a trough which holds the item to be dispensed. The pocket-door is rotatively held by lateral bearings **404** about the horizontal axis of the curved section **403**. When the pocket-door is pulled open by way of the handle **405**, the tail-end of the curved section rises between the item **406** in the pocket and the next one **407** in line to be dispensed as shown in dotted line in FIG. **41**. At the same time, a barrier flap **408** actioned by a lever **409** coupled to the curved section **403** rotates downwardly. The barrier flap combines with the curved section **403** of the pocket-door to prevent access to the good remaining in the station.

A push-plate **410** behind the last item **411** in the station is advanced toward the pocket-door with every closing movement of the latter. The pocket-door is biased toward the closed position by a pair of springs **412**. The push-plate has a nib **413** which projects downwardly through a slot **414** in the floor of the station, and is secured to a pair of continuous driving belts **415**. The belts are driven by a ratchet gear mechanism **416** coupled to a toothed part **417** in the undersurface of the curved section **403** of the pocket-door.

The pocket-door is locked shut by a solenoid-controlled bolt **418** engaging a second toothed section **419** also in the bottom surface of the pocket-door. When the solenoid is deenergized, the bolt **418** is pushed toward the pocket-door by a coil spring **420**, and into engagement with the second tooth section **419**; thus, preventing the door from being opened.

In order to accommodate variations in the thickness of the items, the driving belt **416** is preferably given a certain amount of elasticity. Alternately, some resilient slippage may be allowed between the belt and the nib **413** of the push-plate. If the station floor is slanted downward toward the pocket-door, as was taught in connection with some of the earlier described embodiments of the machine, the push-plate and its driving mechanism may not be necessary.

The pivot-pins **421** for the barrier flap and the pocketdoor bearing **403** are secured to the front frame **422** of the station.

The removable and substitutable magazine **423** comprises the stations and their pocket-doors. The magazine front **424** which consists essentiallly of the pocket-doors and their mechanism is detachable along a line **425** from the rest of the magazine to allow serving and reloading at the supply center.

The currency receptacle **426** is located between the floor **427** of the lowest most station and the floor **428** of the magazine. The card reader **429** and the key pad **430** are mounted on the side of the machine enclosure.

Yet another embodiment of a dispensing gate mechanism **431** is illustrated in FIGS. **46–48**. This mechanism is particularly adapted for dispensing irregularly shaped articles such as bags of chips, and packages of cookies and gum. It could also be used for dispensing beverage cans. The moving gate **432** is arcuate and forms a trough having a quarter-round bottom **433**. The gate is rotatably suspended on each side by a pair of pins **434** mounted on a pair of brackets **435**. The bases of the brackets are secured to the lateral edges of a plate **436** that forms the bottom of a goods-holding channel. The plate slides in its longitudinal direction under the action of a rotating cam **437** activated by a motor **438**. A pair of arms **439** projecting vertically from the top of the lateral walls of the arcuate gate **432** come in contact with two stationary posts **440** and **441** mounted astride the arm. When contacting either one of the two posts, the arms **439** act as levers that cause the gate to swing around its supporting pins **434** about an axis perpendicular to the downward slant of the plate **436**. As illustrated in FIG. **47**, when under the action of the cam **437**, the plate **436** is fully withdrawn, the gate **432** swings inwardly, opening the dispensing slot **442**. It should be noted that the width of the dispensing slot is the sum of the quarter-round chord of the gate plus the amount of translation of the plate **436**. Accordingly, a gate having a radius of 2.5 centimeters (1 inch) when combined with a plate movement of 1.25 centimeters (0.5 inch) can yield a total dispensing slot opening of about 5 centimeters (2 inches). It should also be noted that the trailing edge **443** of the arcuate gate rises above the forward edge of the floor plate **436** to form a barrier that prevents the movement of the item next in line to be dispensed toward the dispensing slot **442**. When the plate **436** is slid forward, the arcuate gate assumes the closed position illustrated in dotted line in FIG. **47** wherein the trailing edge **443** of the gate meets the forward edge of the floor plate. As more particularly shown in FIG. **46**, the interface between the back section **443** and the gate and the forward edge of the plate **436** form a series of intermeshing crenels **444**, and **445**. This configuration prevents pinching the bottom of some of the items to be dispensed between the gate and the plate.

Another embodiment of the dispensing gate particularly adapted for dispensing beverage cans is illustrated in FIGS. **49** and **50**. In this case, the gate is formed by a trapdoor **446** that drops under its own weight away from a resting stop **447** when the sliding plate **448** is withdrawn by as little as 0.625 centimeters (0.24 inch). The trapdoor gate is hinged to the end of the sliding plate **448** by a pin **449** located approximately 1.25 centimeter (1.5 inch) from the rear edge of the trapdoor gate **446**. Accordingly, the back end **450** of the gate forms a barrier to prevent the passage of the next to be dispensed can **451** when the gate is down. A pair of posts **452** fixedly secured to the lateral wall of the good-holding channel come in contact with the upper surface of the rear section of the gate **450** when the sliding plate **448** is moved forward, causing the dispensing gate to rotate upwardly and close the dispensing slot.

Another convenient embodiment of a beverage can dispensing machine is illustrated in FIGS. **51–53**. In this embodiment, the cabinet **444** and the principal magazine **455** are basically similar to those in the embodiment described in FIG. **12**. The front door **456** of the cabinet is hinged at its base **457** rather than its top edge in order to provide the space necessary to mount the auxiliary magazine **458** on top of the principal magazine **455**. In this embodiment, the principal magazine has a capacity of 16 cans. It includes a coin receptacle **459**, and a dispensing gate **460** driven by a cam and motor mechanism **461** of the type illustrated in FIGS. **47** and **48**. The principal magazine is not supported by slides but is installed by first placing the front lower corner on a tilting angled bar **462** with the front of the magazine in a horizontal position, then tilting the magazine upwardly in the direction indicated by arrow **463** until the back end of the moving plate **464** comes in contact with the cam and motor mechanism **461**. The cans rolls along three

levels of slides tilted at approximately 5 degrees from the horizontal. The magazine is loaded from a slot opening **465** on its top which is closed by a sliding gate as will be explained below. The principal magazine **455** can be either completely refilled or simply topped from a portable auxiliary magazine **458**. Accordingly, the service person has the option of either removing the principal magazine and replacing it by a fully loaded one, or use the portable auxiliary magazine **458** to add as many cans as may be necessary to top the principal magazine. The auxiliary magazine **458** has a bottom geometry which is designed to intimately mate with the geometry of the principal auxiliary magazine top. Furthermore, the dispensing gate **466** in the bottom of the auxiliary magazine can only be opened when the two magazines are completely mated. Both the filling opening **465** of the principal magazine and the dispensing slot **466** of the auxiliary magazine are controlled by sliding gates which are activated by similar and mating mechanisms **467** and **468** more specifically illustrated in FIGS. **52** and **53**. Each sliding plate **469** has a pair of longitudinal slots **470** and **471** near its front edge **472**. A first slot **470** is engaged by a lock **473** which is mounted by an angled bracket **474** against the front face of the corresponding magazine. The angled bracket is not attached to the body of the lock but to the shaft that normally mounts the bolt. An enlarged area **475** in the forward end of the first slot is shaped and dimensioned to be engaged by the rotating main body of the lock **476**, the lock is oriented such that when the key **477** is removed, the main body of the lock **476** is locked in the position illustrated in FIG. **53**. Thus, preventing any movement of the gate **479**. The second slot **478** is shaped and dimensioned to pass the key **477** of the other magazine lock. That key is also mounted by a bracket **479** against the front face of the magazine. It can be now understood that in order to free the sliding gate **479** of either magazine, both magazines must be intimately mated with the keys **477** properly engaged into the respective locks. At this point, the main bodies **476** of each lock can be rotated as indicated by a row **480** to allow the sliding gates **469** to be pulled out and open the feeding and dispensing slots **465** and **466** of the respective magazines. A handle **481** associated with each lock body is provided to facilitate the rotation. The auxiliary magazine **458** can be reloaded in a service center by opening a lock-secured top lid **482**.

It should be noted that the service personnel can never get access to the goods held by either one of the two magazines.

In addition to or in lieu of currency, the machine accepts payment by so-called "smart cards". A smart card is a type of debit card which mounts a microchip having the capability of holding a file to which data can be added or substracted. Typically, a smart card can be purchased for a fixed price plus a small service charge. The fixed price corresponds to the amount of money stored in the microchip. Machines adapted to accept payment with such a card have the ability of deducting, from the microchip file, the amount corresponding to the purchase. This type of smart card and associated hardware and software technology are commercially available from Cardlogix of Irvine, Calif. Accordingly, the vending machine is equipped with a microprocessor **483** whose data bus **484** is connected to a variety of peripheral devices including a smart card reader/writer **485** having the capability to read and write on smart cards **486** used by customers and smart cards used by service persons to track the machine performance and inventory. The microprocessor bus is also connected to a keypad **487** upon which the customer can dial his choice of goods, and the service person can enter certain information and instructions. The bus also accesses an alpha numerical display **488** used to communicate visual messages to the customers such as machine operating instructions and the like. Once a customer has made his selection, commands are transferred to a motor control **489** that selects and activates the motor corresponding to the channel into which the selected goods are stored. The position of a variety of status switches **490** can be read by the processor through the data bus in order to verify the proper operation of the machine. An optical sensor **491** located at the entrance of the dispensing slot gives an indication that the selected goods has been dropped into the dispensing pocket. The microprocessor can also release certain latches **492** which enable or disable certain operations of the machine in accordance to certain conditions reflected by the status switches **490**. For instance, the machine will not attempt to dispense goods if the magazine is not properly inserted into the machine and the front door closed. A solid state memory or equivalent recording medium **493** is used to hold the microprocessor operating an application software as well as the inventory information. The microprocessor can monitor all the sales and maintain a detailed inventory in memory. Prior to servicing a machine, a service person introduces a smart card into the card reader and dials a code on the keypad instructing the microprocessor to transfer the inventory data from the solid state memory **483** onto the service person's smart card. The smart card may also contain program instructions that are read and executed by the microprocessor. Those instructions may include price changes or special promotional command to he scrolling display. The smart card, as well as the removed or partially empty magazine, can be turned in at the service center for processing, and refiling and restocking. The service center is equipped with a central processor **494** which is also provided with a smart card reader/writer **495** and a printer **496**. The information read off the service person's smart card **497** is used to verify the returned cartridge contents is consistent with the quantities and types of goods dispersed by the machines, and to generate a complete inventory of the remaining goods held in various vending machines throughout the serviced territory, as well as a schedule of services to be performed during the next day in accordance with the status, that is, the amount of goods still held by the machine previously serviced. Accordingly, the central processor **494** includes a return cartridge software module **498**, a inventory control module **499** and a route planning module **500**. It should be understood that the central processor can also accumulate statistical data about the entire operation.

The smart cards and readers can be advantageously replaced by other recording devices and communication interfaces including palm-held processors using "blue tooth" interfaces, or by direct link through the Internet according to technologies well-known to people in the data processing arts.

The block diagram of FIG. **56** illustrates the processing of a magazine at both the user's site and at the central processing location.

Upon arrival at a user's site, the service person may download **501** the sale data accumulated by the vending machine processor. The downloading can be made on a smart card, a hand-held storage device or any other convenient recording medium. In the case where the machine is in direct communication with the central perocessing location, this step of downloading may be skipped.

Next, the service person secure **502** the expanded or partially expanded magazine that is inside the machine, and unlock and open **503** the cabinet door. In some versions of

the machine, those two steps are accomplished by the sole unlocking of the door. After removing **504** the expanded or previously mounted magazine, a new full magazine is installed **505** into the cabinet. The cabinet door is then closed **506** and the newly installed magazine is unlocked **507**. Again, in some versions of the machine, these two last steps are achieved by locking the door.

The expanded magazine is returned **508** to the central processing location. As the machine is used, its microprocessor compiles **509** sales data such as goods sold and payments collected. On command from a remote location or as programmed, the display is activated or advanced **510** and special price discounts are set up **511** and advertised on the display unit.

When the magazine arrives at the central processing location, it and its contents are inventoried **512**. The magazine is then emptied, washed and sanitized **513**. It is refilled **514** with goods and then assigned **515** to a route for distribution. The filled magazine is transported **516** to a user's site, and the above-described process is repeated.

While the preferred embodiments of the invention have been described, modifications can be made and other embodiments may be devised without departing from the spirit of the invention and the scope of the appended claims

What is claimed is:

1. A method for selling goods from a supply center to employees and customers of a plurality of entities at a number of locations, said method comprising the following steps:

installing at each one of said locations at least one vending machine engineered to dispense a set of said goods out of a removable magazine upon acceptance of a payment;

at said supply center, filling a plurality of said magazines with sets of a diversity of said goods;

establishing routes, each of said routes linking a given number of said locations;

transporting said full magazines to said locations along said routes, and, at each of said locations, mounting one of said magazines in each of said vending machines in place of any other magazine previously mounted therein;

returning each of said previously mounted magazines to said supply center; and

servicing said returned magazines;

wherein, for each of said vending machines, said step of mounting one of said magazines essentially consists of:

opening said vending machine;

removing said previously mounted magazine;

inserting said full magazine in place of said previously mounted one; and

securely locking said vending machine;

in the absence of any currency or discrete goods handling or counting at said locations.

2. The method of claim **1**, wherein said step of filling comprises:

filling magazines engineered to dispense goods only when said magazines are securely mounted in said machines, and to prevent removal of any of said goods when said magazines are outside said machines without using a secured opening means.

3. The method of claim **1**, which further comprises providing each of said entities, for a fee, a plurality of debit cards for distribution to said employees and customers, said debit cards being usable for payments or on said vending machines.

4. The method of claim **1**, wherein said step of installing comprises:

using vending machines engineered to accept currency in payment of goods and to securely accumulate said currency into said removable magazines mounted therein; and

said servicing comprises removing said accumulated currency from said magazines upon return to said supply center.

5. The method of claim **1**, wherein said servicing comprises sanitizing said magazines prior to said refilling with said goods.

6. The method of claim **1**, wherein said step of filling said magazines comprises stocking therein a plurality of comestible goods.

7. The method of claim **6**, wherein said step of installing comprises installing at a plurality of said locations at least one snack food vending machine, are at least one beverage vending machine.

8. The method of claim **7**, which further comprises:

displaying on one of said vending machines a discount price for at least one combination of a snack food item and one beverage item; and

programming said machines to deliver said combination upon acceptance of said discount price payment.

9. The method of claim **1** which further comprises:

automatically compiling into each of said machines, a record of good-selling transactions on a readable medium, and reading said record off said medium at said supply center.

10. The method of claim **9**, which further comprises compiling said record in said magazines; and

said step of servicing comprise reading said record.

11. The method of claim **9**, which further comprises downloading said record onto a carryable recording device.

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